# PRE-HISTORIC ARCHAEOLOGY OF MADHYA PRADESH



R.P.PANDEY

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The present book Geomerphology and Prehistory of Madhya Pradesh, India, by Dr. R. P. Pandey makes an exaustive study of the landscape as well as stone age cultural material. The book has many distinctive features as it is for the first time, the landscape and development of various cultures in changing environments have been understood and are further been correlated with the Palaeontological finds. This could deduce the past environments, early settlement and subsistance patterns. Besides, the book also deals with the statistical parameters explaining functional aspect of characteristic specimens in different periods.

The author himself was engaged in the field studies in the upper part of the Mahanadi and its main tributaries and located many implementiferous and fossififerous quaternary sections which has helped to build up a comprehensive quaternary history of the region. The geomorphological features traced, show how the landscape has gone under modifications. The cultural and faunal material also have been discussed in detail and have been compared with the other industries of the country, to bring out the personality of the region.

Some of the conclusions where the author has arrived at, adds uniqueness and new directions for the study of the geomorphology and prehistoric cultures of the sub-continent.

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# PRE-HISTORIC ARCHAEOLOGY OF MADHYA PRADESH

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R. P. PANDEY

SUNDEEP PRAKASHAN
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*Dedicated to the teachers and parents*

# Preface

The present book is a revised version of my Ph.D. Thesis submitted to the University of Poona. The main focus in this book is laid on the prehistoric cultures and man-land relationship in the upper Mahanadi in particular and in the Madhya Pradesh in general.

The Madhya Pradesh the biggest state of India was plotted on the prehistoric map of India as early as 1873 by Mr. C.A. Hacket on the Narmada near Gadarwara. Although many folliliferous localities were brought to light earlier, this find helped to determine the age of the Quaternary formations along the valley. It is Yale Cambridge Expedition led by De terra and Paterson, which gave an impetus to the Indian researches interpreting the data from the multi disciplinary approach and also tried to build up a palaeoenvironment in the valley. In subsequent years, the scholars from Deccan College Pune, Archaeological Survey of India, Geological Survey of India and many Universities worked in this area and also on the other river valleys. Two important caves and rock-shelter sites namely Adamgarh and Bhimbetka have systematically been excavated yielding continuous cultural succession.

After a short duration field training during M.A. at Banaras Hindu University I got seriously involved in this discipline when I joined the Deccan College and explored the valleys of the Narmada, the Godavari and the Mahanadi. Since upper Mahanadi was considered prehistorically a *terra icognita* and lacking prehistoric quaternary palaeontological and geomorphological informations in the area, I selected this area for my predoctoral research and carried out extensive explorations in the upper Mahanadi and its important tributaries namely the Seonath, the Hasdo and the Jonk which revealed several Mesolithic sites. Subsequent field studies added evidences for complex cultural sequence right from the Lower Palaeolithic to the Mesolithic periods. This book is an humble attempt to explain the material from an interdisciplinary points of view dealing with the detailed study of Palaeolithic and Mesolithic industries including geomorphology, palaeontology and quaternary stratigraphy and as well as statistical application for explaining the prehistoric cultures in a better way.

The book has been divided into five chapters each with an aspect of the field. The first chapter is Introduction, containing a brief history of archaeological

research in Madhya Pradesh as well as in India and geographical, geological geomorphological features of region. Sites and Stratigraphy yielding cultural and faunal evidences including various scientific parameters and palaeontological details have been included in chapter second. The chapters three and four detail the Palaeolithic and Mesolithic cultures, the third being further divided into three sub-sections : Lower Palaeolithic, Middle Palaeolithic and Upper Palaeolithic. These industries have a detailed discussions where the special feature of the industries are given and then have been compared with the other Industries. Finally, Inter-pretation; dealing with the Quaternary environment, Settlement Subsistence patterns and the Summary and Conclusions are separately included in chapter five. However the author is aware of the limitations as some of the problems still stand ahead.

# Acknowledgement

Before I undertook the research work on the Mahanadi, I had some experience of field work in Stone Age archaeology in the Mirzapur area and the Belan valley. I was introduced to the new area of the Upper Mahanadi by Prof. R.V. Joshi, (Prof. of Prehistory). He, not only supervised my work in the college but also inspected practically all the localities in that area and around Nagpur. I cannot express in words my deep sense of gratitude and indebtedness to him for his constant guidance at very stage of my research and constant encouragement during these investigations. I am indebted to Prof. Purushottam Singh, Department of Ancient Indian History Culture and Archaeology, Banaras Hindu University who encouraged me to continue research in Prehistoric archaeology.

I express my deep sense of gratitude to Profs. S.B. Deo and M.K. Dhavalikar, the former Director and Director respectively of the Deccan College Post-graduate and Research Institute for their encouragements and providing facilities in the Dept. of Archaeology of the Institute. Prof. S.B. Deo and Dr. A.P. Jamkhedkar, Director of the State Department of Archaeology, Maharashtra not only allowed me to participate in the excavation camps at Naikund and Borgaon (Megalithic sites) in Maharashtra but also provided facilities for visits to the Megalithic sites around Dhanora in Durg and a historical site at Sirpur in Raipur district in Madhya Pradesh.

I have immense pleasure in recording my profound sense of gratitude to Dr. V.N. Misra, Professor of Prehistory in the Deccan College Post-graduate Research Institute for providing me facilities at Bhimbetka excavation camp where I could have first hand knowledge of excavation in cave and rock shelter sites. This was helpful for me in studying the material at the site and could make use of it in my Ph.D. dissertation. His constant encouragement, affection and keen interest helped me immensely in completion of the work.

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CHAPTER 1

# Introduction and Environment

## A. Introduction

*"An archaeological culture may be defined as a geographically contiguous set of artifacts types that may occur in differing combinations in different functional context and that together form the surviving material expression of a distinctive way of life sufficiently comprehensive to permit its bearers to perpetuate themselves and their behavioural patterns over successive generations".*

B.G. Trigger 1978 : 76

Although the beginning of prehistoric studies in India can be traced back over one hundred years, it is only during the last nearly thirty years the prehistoric potentialities of most of the regions of this country have been estimated by extensive surveys carried out by the archaeologists from the Universities and Government organisations. The sequences of palaeolithic cultures and their stratigraphic and environmental background in such regions are now also fairly well understood, albeit mostly in broad outlines. In a vast country like India with varied geographical settings of different parts, the palaeoenvironment and possibly the prehistoric cultures are bound to show some variations. To investigate these details of inter-relationships of environment and cultures intensive regional studies are always essential. With this aim the present writer had undertaken archaeological survey of the Upper Mahanadi valley covering parts of Bastar (Jagdalpur). Raipur, Durg, Bilaspur and Raigarh districts of Madhya Pradesh (Fig. 1).

Some work had been carried out in this valley in its lower course in Orissa (Mohapatra, 1962 and Tripathy 1974) but the upper Mahanadi valley had not yet been traversed. The location of the Mahanadi region is interesting. The tribal belt of Bastar lies close to its south. The important prehistoric sites of the Narmada Basin and the Son Basin lie to the north of it. Geologically and climatically also it has a special place in the geography of Central India. While conducting research in the upper Mahanadi valley I have tried to make use of varied data obtained in the field work—sedimentological, palaeontological as well as the collection of Stone Age artifacts.

**Brief outline of archaeology of upper Mahanadi valley**

The field work in the valley was conducted from 1976-1979. During the first field season the exploration was initiated on the Mahanadi proper for tracing out the evidences of early man which enabled the discovery of mesolithic open air stations in the area (Pandey 1977a : 686, 1977b : 121). The survey was further carefully resumed on the Mahanadi proper with the belief that like the neighbouring areas other lithic cultures also could be present. During this work, two Lower Palaeolithic sites situated at the foot of the hills were brought to light but the evidences of other industries such as Middle and Upper Palaeolithic could not be obtained. But the traverses on the major tributaries of Mahanadi yielded Middle and Upper Palaeolithic industries. Apart from Stone Age cultures, these tributaries have well exposed thick alluvial deposits. Two gravel beds designated as Gravel I and Gravel II were found which yielded Middle and Upper Palaeolithic tools associated with vertebrate and invertebrate fauna (Pandey, 1978: 4, 1980 : 135-146 and Joshi *et al* 1980: 169-175).

Altogether 45 prehistoric sites have been discovered in the area, in which 3 belong to the Lower Palaeolithic, 5 to the Middle Palaeolithic, 4 to the Upper

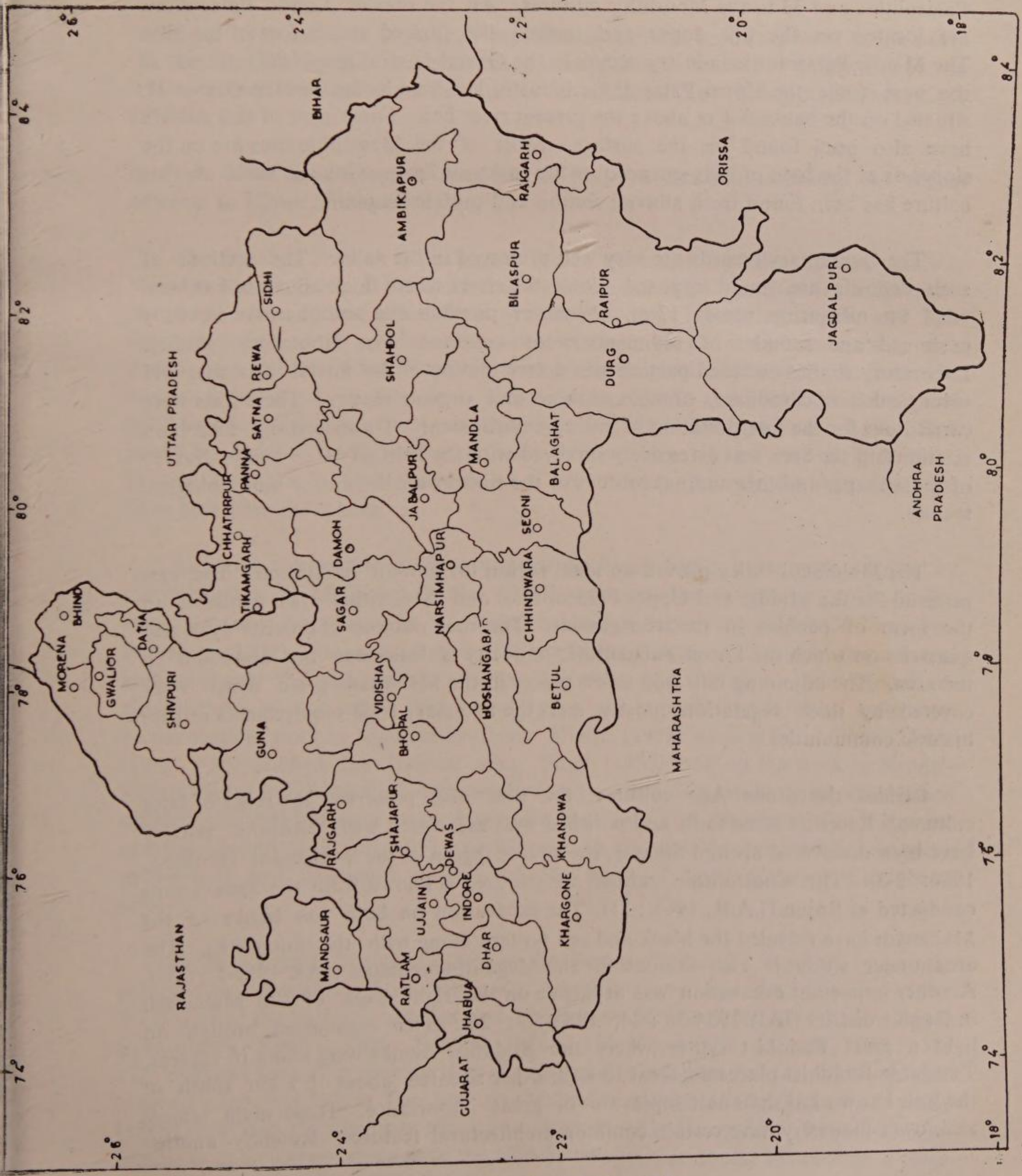



**Fig. 1. Madhya Pradesh Map Index**

Palaeolithic and 33 to the Mesolithic cultures. All the sites of Lower Palaeolithic are located on the hill slopes and in the gullies formed at the foot of the hills. The Middle Palaeolithic industry occurs in the Gravel I, stratigraphically found at the base while the Upper Palaeolithic industry has been located on the Gravel II, situated on the banks 3-4 m above the present river bed. Some sites of this culture have also been found on the surface. Most of the Mesolithic sites are on the slopes or at the base of hills spread over the rocky surfaces. One site each of this culture has been found from alluvial section and on laterite plain.

The Quaternary records are very well preserved in the valley. The sections of such deposits are found exposed along the rivers where thick alluvium has been piled up measuring nearly 13 m. Wherever possible the sections were carefully examined and samples of sediments were collected for laboratory studies. Laboratory studies included particle size determination of the fluvial deposits, pH value, calcium carbonate, organic carbon and organic matter. These tests were carried out for the interpretation of palaeo-environment. To understand man-land relationship the area was extensively surveyed with the help of 1″ =1 mile Survey of India maps, and longitudinal profiles of the rivers were drawn for morphological studies.

The Mahanadi valley proved an ideal region for human habitation. The raw material for the Middle and Upper Palaeolithic and Mesolithic was available in the form of pebbles in the river gravels. The rock outcrop of dolerite dyke and quartzite on which the Lower Palaeolithic industry is fashioned are abundant in the area. The adjoining hills and a few places in the Mahanadi plain which were covered by thick vegetation mostly met the necessary food requirements of pre-historic communities.

Besides the Stone Age cultures, the area also preserves the relics of later cultures. Recently some tools and polished axes associated with Neolithic pottery have been discovered around Sihawa, the source region of the Mahanadi (Krishna, 1980: 2-3). The Chalcolithic culture in the area is known from the excavations conducted at Rajim (I.A.R. 1968 : 11). The excavation on both the banks of the Mahanadi have revealed the black and red pottery along with the microliths. The area under study is also famous for the Megalithic remains (IAR 1956-57 : 35). Another important excavation was at Sirpur on the right bank of the Mahanadi in Raipur district (IAR 1954-55 : 24, 1955-56 : 26). This excavation brought to light a great Buddhist centre where the Buddhist monks were living in viharas. Two large Buddhist places adjacent to each other situated about 1.5 km south of the well known Lakshmana temple are of great importance. These main temple and lower monastry have certain common architectural features. Recently another

historical site, namely Malhar in Bilaspur district has been excavated in the north of the Seonath river. The excavation has yielded varieties of antiquities on the basis of which the habitational deposit is divisible in four different periods (IAR 1975-76: 23).

**A review of the archaeological research in Madhya Pradesh including the region adjacent to Upper Mahanadi Valley**

The Madhya Pradesh is the biggest Indian state and includes ancient Malwa, Madhya Bharat, parts of Bundelkhand, Baghelkhand and Chhattisgarh etc. Environmentally, culturally and ethnically it is indeed a very interesting region and still draws attention of the scholars of various disciplines. Even archaeologically this state is very rich and has yielded immense archaeological evidences right from the earliest period to the modern times. Since the area (20°0′ and 22°21′ N latitude and 80°0′ and 83°15′ E longitude) studied by me falls in Madhya Pradesh (Fig. 2) it would be useful to briefly review the work that has been carried out in this state. It is not possible to give the details of all the sites and only the important sites have here been dealt with.

Although the occasional discoveries of the Stone Age cultures were known by the publication of Medlicott (1873 : 49-57) however the systematic work in the state started from the visit of Yale Cambridge Expedition led by De Terra and Paterson (1939). Having studied the quaternary sections Palaeontological and archaeological findings on the Narmada valley, they tried to build up palaeo-environment of the area. This work gave an impetus to further systematic archaeological work in Madhya Pradesh. Khatri (1958) worked in Malwa, Joshi (1961: 5-35) studied the Damoh area, Singh (1965) took up the work in Bundelkhand region and Ahmed, (1966) concentrated on the Son valley and established different cultural horizons on the basis of excavations and discovery of tool-bearing gravels. Soundara Rajan (1961 : 68-85) tried to find out the relationship between pebble-tool and flake-tool cultures on the basis of his discoveries of the Rewa area.

As the Narmada is a classic area in the Peninsular India it was very frequently surveyed by the scholars from different points of view. Sen and Ghosh (1960 : 3-23) studied the cultural complex and Pleistocene stratigraphy of the Narmada. Subsequently Khatri (1961 : 519-530, 1962a : 191-208, 1962b : 186-196, 1966 : 113-133) explored several implementiferous and fossiliferous sites on the Narmada and claimed a separate Pebble Tool horizon (Mahadevian) at Mahadeo Piparia. Supekar (1966) excavated the same site which revealed not only the pebble tools but also handaxes and cleavers along with the Middle Palaeolithic tools. Meanwhile a team

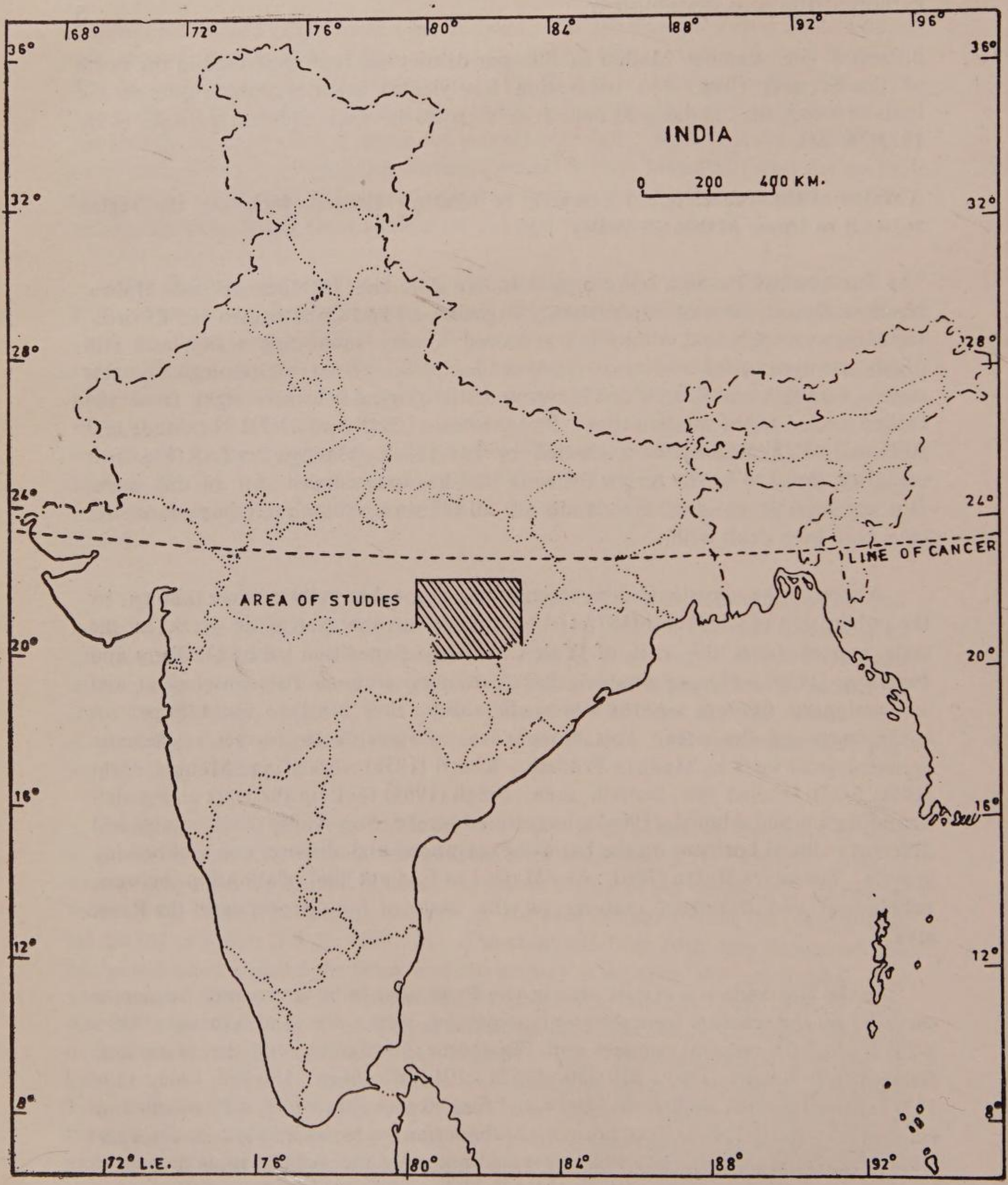



Fig. 2. Area of Studies (Madhya Pradesh)

consisting of scholars from Deccan College, Archaeological Survey of India and CSIR surveyed the river right from its source (Amarkantak) to Hoshangabad and also revisited the sites earlier discovered by De Terra and Paterson as a multi-disciplinary approach (Sankalia 1974 : 113-114). Bioarchaeological work by Badam (1976) led him to discover some new implementiferous and fossiliferous sites. Recently the Narmada was re-examined around Jabalpur as a result of which some new sites have further been located (Joshi *et al* 1981). Apart from the upper and central reaches, the lower reaches of the valley were also explored and excavated around Maheshwar Navdatoli (Sankalia 1952, Sankalia *et al* 1958, Joshi 1958: 201-204 and Armand 1980) and Gandhi Sagar Dam (Wakankar). These sites have yielded not only the Stone Age cultures but the later cultures also. In the drainage system of this river some of the important primary sites have been excavated at Adamgarh (Joshi 1964a, 1964b: 150-163, 1968 : 245-264 and 1978) and Bhimbetka rock shelters (Wakankar 1973 : 23-33, 1978 Misra 1977, 1978 and 1980). These sites have preserved a continuous stone age cultural sequence. Most of the rock shelters of this area have painting on their walls and ceilings which have been studied extensively. Various phases have been recognised in them (Wakankar 1962; 1973, 1978a, Mathpal 1978, Misra and Mathpal 1978 : 27-33 and Dikshit 1932, Khatri 1964 : 759-769. Other regions of Madhya Pradesh have also evidenced rock paintings (Wakankar 1973, Pandey 1970 and Singh 1978 : 15). Jacobson (1978) found Acheulian factory sites in the Raisen and Hoshangabad districts of Madhya Pradesh while on the north-eastern extension of the Vindhyas Allchin (1959) discovered four palaeolithic sites. Rock shelters bearing rock paintings have also been excavated in other regions like Mori in Mandsor district (IAR 1958-59 : 28). Seoni region has also yielded the evidences of stone age cultures on the Weinganga valley (Joshi 1964 : 150-163, 1966 : 276-280), while a Middle Palaeolithic site has been discovered near Indore (IAR 1966-67 : 17). Recently some riverine sites belonging to different cultures have been excavated on the Son in Rewa district (Sharma 1978 : 88-99).

Madhya Pradesh is famous for the later cultures also. Many sites have been explored and excavated in the different regions which throw light on the post-Mesolithic cultures in the state. Although the Neolithic tools have been discovered from several sites no site of this culture has yet been excavated. The Neolithic sites are Nandgaon and Arjuni in Durg district; Hoshangabad in Hoshangabad district; Kundam, Burchenka, Manai and Jabalpur in Jabalpur district; Hata and Damoh in Damoh district; Garhimorila, Sagar (Dikshit 1954 : 38-39) and Eran (IAR 1960-61 : 62) in Sagar district and Jatkara (IAR 1965-66 : 40) in Chhatarpur district of Madhya Pradesh.

The relics of Chalcolithic culture are prolific and many sites have been brought to light from the various parts of Madhya Pradesh (Sharma 1974 : 154-159). How-

ever, a limited number of sites have properly been excavated which have yielded varieties of antiquities. Some of these sites have been placed at a very early date of Chalcolithic Culture. Among the Chalcolithic cultures in Madhya Pradesh, the Kayatha has yielded the evidences of earliest culture (IAR 1964-65 : 16-17, Wakankar 1967 : 1-40, Dhavalikar 1970 : 86-93 and 1970/71 : 24-30 and Sankalia 1974 : 422-434). This culture has some elements of Harappan and pre-Harappan cultures but the decorations and designs over the potsherds are different than those found on the Harappan sites. The excavation has revealed the antiquities of ten cultural periods which show a continuous habitation right from 2200 B.C. to the modern times. Now Dr. Wakankar has discovered more sites yielding antiquities of Kayatha Culture around Kayatha. Of these an important site namely Dangwada on the Chambal has recently been excavated (Wakankar 1980). This site has also yielded the evidences of various cultural levels from Kayatha to Muslim-Maratha period, Kayatha wares at Dangwada have been decorated with red colour, the style of which resembles with the pre-Harappan instead of Harappan style. A few potsherds are of the Sothi style. O.C.P. wares have been found to be associated with it. Other objects found in this level show different aspects of the people of Kayatha culture.

The other famous Chalcolithic site in this region is Navdatoli (Sankalia, Subbarao and Deo 1952/53 : 1-157) Sankalia, Deo and Ansari 1971). Apart from the Chalcolithic, stone age cultural material has also been found around this site. The site is extensively excavated and has yielded varieties of antiquities which throw light on the various aspects of human activities and colonization. Cereals of different species have been unearthed which give the idea of the subsistence economy of the Navdatolians. Stone artifacts of various types, and several objects of metal indicate the means of war and defence. There are varieties of evidences which throw light on the religion, ornament and art and crafts. The settlement continued upto late Medieval period at this site.

The other better known sites in this region are Eran in Sagar, Nagda in Ujjain, and Awra in Mandsor districts. The Nagda on the Chambal was excavated by N.R. Banerjee (IAR 1955-56 : 20-25). The houses were of mud brick and had some sort of fortification. The potteries and designs are typically Malwa. The Eran (ancient Arikin) on the Bina river is much more extensive and revealed the cultures upto 1800 century A.D. (IAR 1960-61 : 17-18, 1961-62 : 24, 1962-63 : 11-12, 1963-64 : 15-16, 1964-65 : 16-18 and Bajpai 1967 : 17-19). The site had natural protection from three sides and on the fourth side a rampart and a moat were constructed. The black and red wares having different types of painting occurred throughout the three phases. Some of the paintings are quite similar to Navdatoli. At Awra (ancient Apra) a small excavation was carried out by H.V. Trivedi (1962 : 13-40 and IAR

1959-60 : 24-25). The excavation has yielded the evidences of Chalcolithic period onwards upto Muslim-Maratha period. On the basis of the antiquities six cultural periods have been identified here.

Besnagar, District Vidisa, is also an important site. It had been excavated earlier (Lake 1910 and Bhandarkar 1913/14) also but these excavations evidenced only temple structures, terracotta figurines, ivory bangles, iron and copper objects, beads, potteries and varieties of coins. Later on this site was systematically excavated (IAR 1963-64 : 16-17, 1964-65 : 17-18, 1965-66 : 43-45). On the basis of varieties of antiquities six periods of habitation ranging in chronology from pre-Northern Black Polished wares to post-Gupta times were identified, while at Tripuri (ancient Mahishmati) in Jabalpur district cultural layers range from 1000 B.C. to 100 A.D. and have been divided into five periods (Dikshit 1966, IAR 1965-66 : 21-22, 1966-67 : 17-19, 1967-68 : 23-24 and 1968-69 : 46).

An excavation at Manoti in Mandsor has revealed seven cultural periods (IAR 1959-60 : 25). The potteries of this site are similar to that of other sites like Ahar and Nagda in first group, Maheshwar in second group, Lothal in third group and in the fourth group are the black wares.

Small scale excavation at Bilawali district Devas has yielded potteries and coins (IAR 1962-63 : 10). At Pasewa (IAR 1957-58 : 28) various types of potteries and objects made on clay and glass beads have been encountered while at Kasrabad (IHQ 1949 : 17-18) the evidences of Buddhist culture have been found. The excavations at many sites like Indragarh (IAR 1958-59 : 28), Gyaraspur (IAR 1932-33 : 6-7) Pawaya (ASI annual report 1924-25 : 165-166, 1925-26 : 190 and 1915-16 : 101-108 and Patil 1952 : 80), Pipariya (IAR 1968-69) and Mandsor (IASI annual report 1922-23 : 185-86) revealed the evidences of temples of different periods which show the religious aspects of the society.

Although the entire Madhya Pradesh is traversed by the archaeologists there are still some patches left out which do not provide many information regarding Stone Age cultures. Among these is the valley of the upper Mahanadi. Lower Mahanadi in Orissa is known as early as from the last quarter of the 18th century (Ball 1976 : 122-123) Later on Vrendenburg (1906 : 33-48) studied the profile of the Mahanadi and postulated the tectonic activity in this region. He also mentions that no gravel and Pleistocene deposits could be noticed along this river. The lower valley was systematically surveyed from the prehistoric points of view by Mohapatra (1962) and Tripathy (1972) and has yielded the Stone Age evidences.

The adjoining areas of the upper Mahanadi have yielded the evidences of Stone Age cultures and rock paintings. In the north, the Narmada (Khatri 1961,

1966, Supekar 1968) and the Son rivers (Ahmed 1966), Singhanpur and Kabra Pahar (Mitra 1929 : 6) in the east the Brahmani and the Baitarni (Mohapatra 1962) and the Tel (Tripathy 1972) in the south Bastar district (Jha 1969, Krishnaswami 1952) and in the west Chanda district (IAR 1959-60, 1960-61 and 1961-62) have proved to be rich in prehistoric cultures. In contrast with the Stone Age evidences and their presence in stratigraphic context on other important river valleys of M.P., the upper Mahanadi valley remained virtually unexplored from the points of view of Stone Age cultures. The Mahanadi is one of the important perennial rivers of Peninsular India, the upper part of which flows in an important 'Geographical Zone', the part of which is named as 'Chhattisgarh Basin'. The primitive tribals are still present in the valley. In the Bastar district (Jagdalpur) which forms the southern part of the valley the tribals are, to a large extent, nomadic and lead 'hunting and food gathering' ways of life. Taking these facts into consideration the writer has selected the area for investigating 'Archaeology of the upper Mahanadi valley'.

**A brief review of earlier work in India**

After the work of De Terra and Paterson (1939) Indian archaeology really got an impetus and scholars started working in different parts of India. Krishnaswami (1938 : 58-90) worked in Tamilnadu, Bose and Sen (1948 : Bose *et al* 1950 : 49-55) in Orissa and Sankalia (1974) in various parts of India. Zeuner as early as 1950 undertook the cultural and environmental studies of Gujarat, and on the basis of cultural deposits tried to investigate climatic fluctuations during Upper Pleistocene while Joshi (1955) worked on Pleistocene deposits of the Malaprabha basin, Karnataka.

Later on, alongwith the observations of Quaternary sections, the emphasis was also given to the sedimentological studies for understanding the nature of deposition and environmental conditions prevailing during Pleistocene and Holocene periods. With this aim different parts of Maharashtra and Gujarat such as Mula Mutha valley (Rajaguru 1970), upper Krishna (Pappu 1974), coastal tract (Guzder 1975), Bhadar valley (Lele 1972), and Hiran valley (Marathe 1977) were studied. On the basis of sedimentology, fluvial morphology and archaeology, it became possible to draw conclusions that during the Quaternary the climatic changes were of a degree not of a kind.

Recently an exhaustive work has been carried out in the great desert of Rajasthan and Gujarat (Allchin *et al*, 1978, Misra *et al* 1980 : 19-31, and Misra *et al* in press) Various aspects, such as artifactual material, fossil aeolian beds, reddish soil, calcrete and cross bedded miliolite were studied. On the basis of these

studies the evidence of wetter climate has been found during Pleistocene. Gurdeep Singh (1971), by palynological study of the sediments of Sambhar, Didwana and Lankaransar, has suggested wetter climate between 6000-3000 B.C. On the basis of faunal evidence Murty (1979) is of the opinion that humid or per-humid condition prevailed during the Upper Palaeolithic or terminal Pleistocene in Kurnool area, Andhra Pradesh.

At several places fossils have been found associated with stone artifacts. On the basis of fossils the age of deposits and associated cultural material has been estimated. The present faunal evidences coming from alluvia of several river valleys indicate that the animal fossils hithertoforth considered as index for middle Pleistocene (*Equus nomadicus*, *Bos namadicus*, *Elephas hysudricus*, *Stegodon insignis ganesa*) actually range from middle Pleistocene to late Pleistocene. Other species like *Elephas maximus*, *Cervus duvauceli*, *Rhinoceras unicornis* etc. range from late Pleistocene to Holocene, and only *Hexaprotodon namadicus* and *Sus namadicus* are today considered an index fossils for the middle Pleistocene (Badam, 1977 and Joshi *et al* 1980 : 164-181).

On the basis of chronostratigraphy, lithostratigraphy and biostratigraphy Kajale (1978) has tried to trace the palaeoenvironment of the Ghod valley Maharashtra and has reached to the conclusions that this area did not experience drastic climatic changes.

Further awareness in the field of Archaeology during the last decade or so lead scholars to follow new archaeological methods and approaches for the reconstruction of life ways of prehistoric communities. These studies have been focused on settlement and subsistence patterns. The mapping and measurements were done to find out extent and relationship of sites in the Hunsgi valley. On the basis of faunal evidences and wild plants and fruits still used for eating in the area the food habits of the prehistoric societies were built up (Paddayya, 1978, Murty 1975 and Reddy 1980a : 202-227). In Andhra Pradesh Murty (1978) has recognised several varieties of wild fruits, edible plants roots and tubers on which prehistoric communities of the area must have depended for their subsistence. Patterning of dwelling and other features were studied for the clues of demographic and social parameters of early cultures (Murty 1981 : 45-59, Raju 1981, Reddy and Ameer 1981) in Andhra Pradesh and in Madhya Pradesh (Pandey 1981) and Neolithic-Chalcolithic communities at Inamgaon (Dhavalikar 1977 : Sankalia 1974 : 478-513). Settlement and subsistence studies are also taken up for the cultures of later periods like Painted Grey Ware and Northern Black Polished Ware (Lal 1978).

The ethno-archaeological researches are also being pursued for understanding house patterns ceramic remains and other domestic materials and social aspectsby

studying the present day villages in M.P., Rajasthan and Karnataka (Misra *et al* 1977, Nagar 1967 and Nagaraja Rao 1965 : 48-486). Allchin (1972) and Murty and Sontheimer (1979 : 163-184) after having studied the Central and South Indian shepherd nomads have tried to interpret prehistoric pastoralism.

Statistical methods have now been increasingly used for attempting standardisation of typology and functional analysis of Palaeolithic and Mesolithic industries (Misra 1967 : 22-147, Jayaswal 1978 : 38-53, Joshi and Marathe 1976 : 48-60 and 1975/76 : 4-12).

Yet another attempt in the recent years is to apply chemical methods for locating prehistoric and later cultural sites by determining phosphate, nitrogen, carbon etc. (Joshi *et al* 1978 : 73-83, 1979 : 23-27, 1981 : Joshi and Deotare, 1980a, 1980b, Deotare and Khsirsagar 1980 : 36-40 and Deotare and Joshi 1981).

## B. Environment

*"Human beings are an element of the landscape, an element whose activity is incorporated in it, a modifying agent of the environment which 'humanizes' it. Men whatever they are doing never get absolutely free from the grip of their environment".*

L. Febure and L. Bataillon 1925 : X

The present being the key to the past for understanding the cultural evolution of settlement patterns, subsistence and other activities of man in the prehistoric past it becomes necessary to have a proper understanding about the environmental factors of today. These factors are the physiography, drainage, geology, geomorphology, climate, flora and fauna.

Below is given a broad outline of the existing geographical background of the upper Mahanadi which includes parts of Bastar, Raipur, Durg, Bilaspur and Raigarh districts. The information included in this chapter is partly based on writer's observations and partly collected from the published records.

**Physiography**

The upper Mahanadi valley forms the south-eastern part of Madhya Pradesh. Between the Maikala range and Chhotanagpur in the north and the Orissa and Bastar hills in the south lies a corridor of upper Mahanadi valley which covers a greater parts of Chhattisgarh plains. The entire area has been divided in two main physiographic parts based on relief and the nature of the surface (Fig. 3).

(a) The Plains.

(b) The Hills.

(a) The great plain of the upper Mahanadi lies to the west and north of the Mahanadi river at an elevation ranging from 330 AMSL on the eastern margin to 212 AMSL in the west. Four major rivers Mahanadi, Seonath, Hasdo and Jonk are responsible for the development of this landscape. Excepting the Hasdo which meets the Mahanadi on its left bank, all other rivers flow towards north. The Mahanadi flows at the eastern edge of the Chhattisgarh basin and close to the hills due to which the Mahanadi plain is comparatively narrower than that of the Seonath which passes through level country and had much more scope to form an extensive plain. The valley lies on the Cuddapah sedimentary rocks having a gentle dip in the area. The major portion of the valley is a low lying area drained by small shallow streams. Their interfluvial intersectors have developed slight surface undulations. Along the great plain the elevation of the surface rises steeply in almost all directions. In the south-west it gradually merges into the granitic and gneissic peneplains of Bastar. Most of the plain is covered by a veneer of soils developed locally. However rugged areas of rock outcrops littered with weathered rock pieces are also observed in some of the areas near Simga and Bansankra villages. The plain is mostly covered with tropical reddish yellow silt but there are some patches of black soil closely resembling with the black cotton soil. The monotony of the upper Mahanadi plain is broken by granitic inselbergs

KORBA BASIN
Bilāspur
Chāmpa
Sakti
Mungeli
Pendra
Gaurela
Takhtpur
Kenda
Lormi
Kota
Chorbahar
Turamdih
Dharpa
Korba
Baloda
Jānjgir
Akaltara
Sarsinwāpāra
Bilaigarh
Dabra
Nawapara
Kolya
Lara
Sumja
Dadar
Sirgiti
Kurangi
Arang
Mallesamund
Ringnikhar
Kurud
Kopra
Singhpur
Pairi
Garibband
Nagpura
Dari
Pulgaon
Bindra Nawagarh
Fulijhar
Bhatgaon
Dhamtari
Marimunda
Mahanadi
Sihawa
Kanker
Bastar
Kondagaon
Jagdalpur
Narainpur
Antagarh
Bhilai
Raipur
Durg
Raj Nandgaon
Abhanpur
Tandula
Gondali
Balod
Dondi
Lohara
Bemetara
Simga
Saraipali
Kharod
Pithora
Basna
Chandarpur
Kasdol
Bhatapara
Baloda Bazar
Kawardha
Pandaria
Kawardha
Mohla
Ambagarh Chauki
Rajnandgaon
Dongargarh
Khairagarh
Chhuikhadan
Gandai
Dongargaon
Bemetara
Saja
Bilaigarh
Akaltara
Jānjgir
Champa
Pamgarh
Sakti
Malkharoda
Pithora
Basna
Saraipali
Kharod
Kasdol
Arang
Simga
Bemetara
Dharsiwa
Gunderdehi
Chandrapur
Tilda
Newra
Bhatapara
Baloda Bazar
Kawardha
Pandaria
Mohla
Ambagarh Chauki
Rajnandgaon
Dongargarh
Khairagarh
Chhuikhadan
Gandai
Dongargaon
Kanker
Bastar
Kondagaon
Jagdalpur
Narainpur
Antagarh
Bhilai
Raipur
Durg
Raj Nandgaon
Abhanpur
Tandula
Gondali
Balod
Dondi
Lohara
Bemetara
Simga
Saraipali
Kharod
Pithora
Basna
Chandarpur
Kasdol

and small hills. The Mahanadi plain is fringed by some river basins which lie between the hills. Notable among these are the Kankar basin in the south and Korba and Raigarh basins in the north.

(b) The Mahanadi plain is bordered by a few broken hills and small plateau surfaces. On the north-western edge, the Maikala range runs along western borders of Durg and Bilaspur districts and rises sharply from about 450 m elevation at the foot near Chuikhadan and Kawardha to 700-900 AMSL high at the crestline. This portion of Maikala range is chiefly composed of the Deccan Traps. The northern boundary of the plain is formed by hills and plateaus namely Lormi plateau, Pendra plateau, Chhuri hills and Raigarh hills running from east to west. These hills and plateaus are formed of granite, quartzite and Gondwana rocks rising about 700-900 AMSL more or less comparable with the height of Maikala range. The northern wall is broken by the Arpe, the Hasdo and the Mand rivers. On the eastern edge of the plain the Raipur uplands run parallel to the Mahanadi and lie close to it. The height of these vary from about 300 AMSL at the bottom and 400-500 AMSL at the top and contain granite and Cuddapah group of rocks. In the extreme south and southeast stands scarps of the granite rocks of Bastar. The Orissa plateau rises to a height of 800-900 AMSL in the source region of the upper Mahanadi valley. It has been observed that the Mahanadi plain is largely bordered by granite and gneisses with their characteristic rounded topography and forest cover.

**Drainage**

The drainage network of the area is composed of the Mahanadi and its affluents.

## THE MAHANADI RIVER

The Mahanadi is one of the easterly flowing rivers of India. The river has its source from the spurs of Sihawa hills near Sihawa (20°20′ N: 82°9′ E) roughly 100 km south-east of Raipur district of Madhya Pradesh and flows westward for a distance of about 30 km before taking a turn to the north-west in which direction it further flows for another 30 km. The river again turns to north-east from Charama (Bastar district) and flows for about 200 km through Dhamtari and Nawaparn on its left and Rajim and Sirpur on the right bank. At Changori the river is joined by the Seonath, another easterly flowing river. Taking the Seonath on its left, the Mahanadi turns to the east and separates the district Raipur from that of Bilaspur. Further east the River cuts through Raigarh district and then enters in the state of Orissa near Sankra. Hereafter the river flows to the south-

east upto Sambalpur, thence to the south upto Sonepur and further east before getting into the Bay of Bengal near Cuttack. The total distance covered by it from its source is about 1000 km and the total drainage area of about 1,32100 sq. km.*

The Mahanadi is the biggest river of the area. Even in the source region it has got wide river bed. Wherever it flows through the hills the river has narrow channel. The river bed in the upper portion is sandy covered with brown coloured fine sand. At some places the sandsheets are about a metre thick but in the lower reaches as was observed near Sonepur, the river bed is covered with huge boulders of about 3-4 m in diameter. The boulders are mainly of granite but quartz, quartzite, chert and jasper pebbles having smaller size (generally 3-4″) rounded and sub-rounded in nature were also noticed in the river bed. Along the banks gravel formation was also observed at the base (Gravel I) as well as at a higher level (Gravel II). These gravels are absent in the upper reaches of the river. Thick alluvial sections are rarely seen. Throughout the valley sections are only 3-4 m high and rarely exceeding more than 5 m as at Tanhkapur village. Some low terraces were also seen near this village (*Plates 1 and 2*). In the recent past maximum forest destruction in the area has taken place due to which soils are exposed and now getting eroded during rainy seasons. In this process the gullies have been formed along the banks as at Sonepur.

In the upper reaches the river mainly flows on the shale rocks of the Cuddapah group. The rocks were found to be exposed near Kasdol and during dam construction at Rudri. Nowhere the river is noticed cutting through the bed rock. This may be due to hard rock at the base and spreading of water in the entire channel which causes less violent currents even during monsoon seasons. Excepting the main river and some important tributaries all the small rivers and streams go dry during summer season, but at some places, specially in hilly and forested areas, the springs provide water to the tribals living in the jungles and nearby almost all the year.

## THE SEONATH RIVER

The Seonath is the second important river of the area. It rises at 626 m AMSL in the Chhiroli hills near Betaghar in district Rajnandgaon, Madhya Pradesh. From the source, it flows to the north upto Mirche and then to the east

*In the absence of the toposheets covering the entire Mahanadi valley it was not possible to reconstruct the long profile of the entire river: Thus long profile of the upper part of the valley covering upto Chandarpur is drawn. The river however rises at an elevation of 463 m and drops down to the sea after flowing a distance of nearly 1000 km. Thus the average gradient of the entire river works out to be 0.463 m/km. (Fig. 4 and 5).

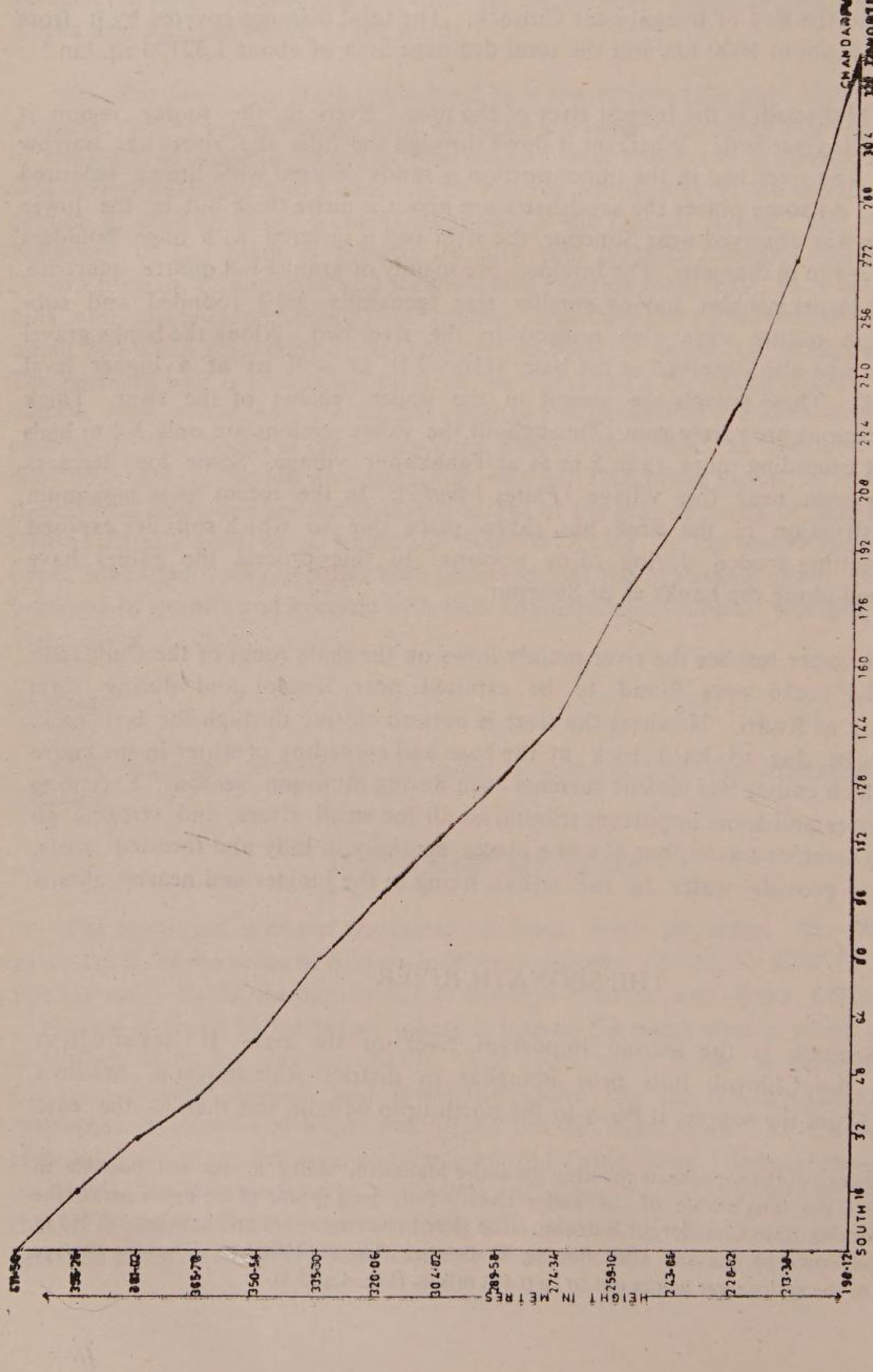



Fig. 4. Longitudinal Profile of the Upper Mahanadi

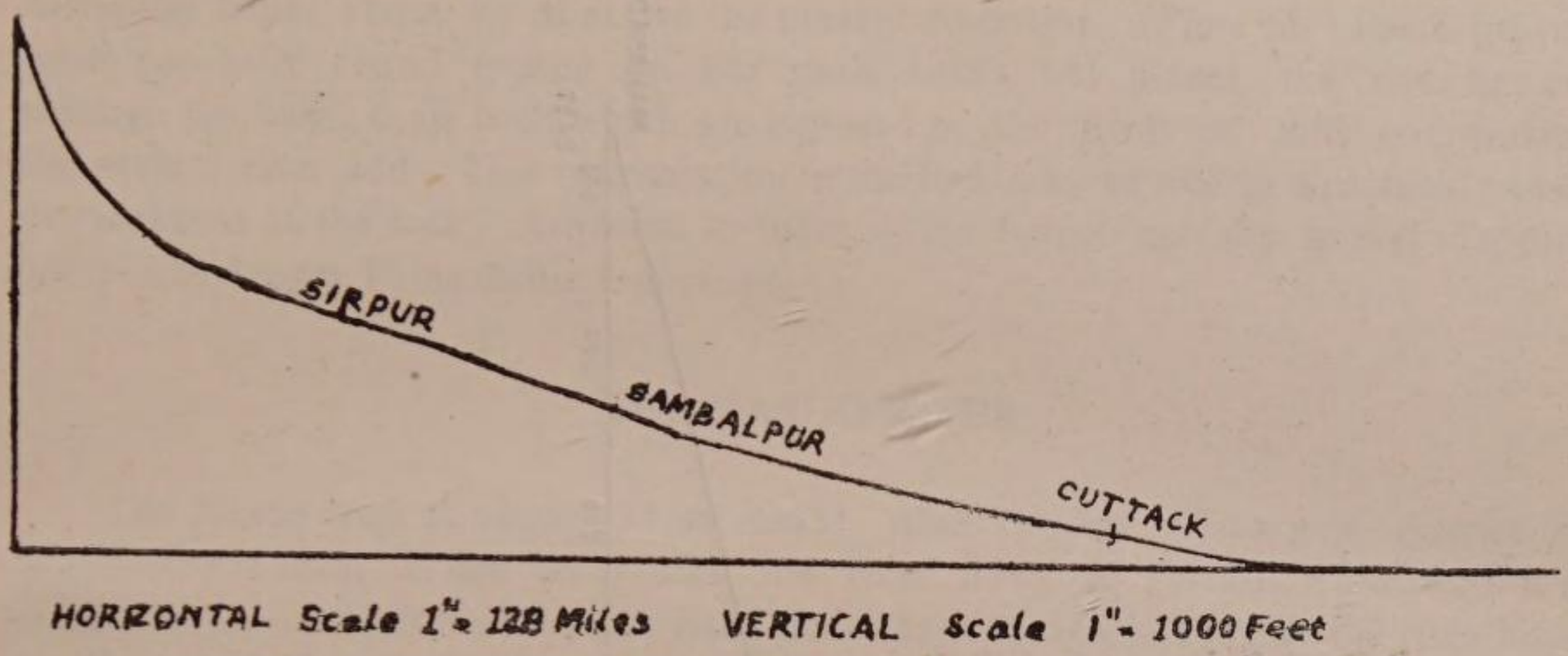



Fig. 5. Longitudinal Profile of the Mahanadi river after Vredenburg 1906

upto Ambagarh Chanki. Near Ambagarh Chanki the river takes a south-eastern turn and then flows through Durg, Bilaspur and Raipur districts to join the Mahanadi. The total distance covered by the river is about 355 km. The average gradient of the river Seonath is about 0.350 m/km (Fig. 6).

The Seonath river is joined by several tributaries on its left and right banks. Some of the left bank tributaries are the Amner, the Surhi, the Dotu, the Karua, the Hanp, the Maniari, the Arpa and the Lilagar. Only a few rivers join the Seonath on the right bank, the main ones are the Tandula and the Kharun.

The Seonath is a perennial river and has more length than the Mahanadi before the confluence. Rising from the Chhiroli hills it flows through plains upto its confluence with the Mahanadi. The bed of the Seonath river is less wider than that of the Mahanadi and hardly extends upto 200 m. At places the terraces have been formed. The higher terrace is about 8 m and the lower just 2-3 m above the present river bed. The river has developed meanders at several places where thick alluvium has been piled up (*Plate 3*). Even otherwise the alluvium along both the banks is generally thick. But in places it is upto 13 m thick. Steep sections are common on both the banks and were noticed throughout the middle and lower reaches of the river (*Plate 4*). These sections have in places preserved gravels at the base but more often they are composed of sub-recent alluvium only. On this river two types of gravels could be distinguished: Gravel-I and Gravel-II. The Gravel-I occurs at the base almost at the present water level and sometimes even below as observed at Nandghat in the trenches dug by the P.W.D. during the construction of a bridge (*Plate 5*). The Gravels II were found

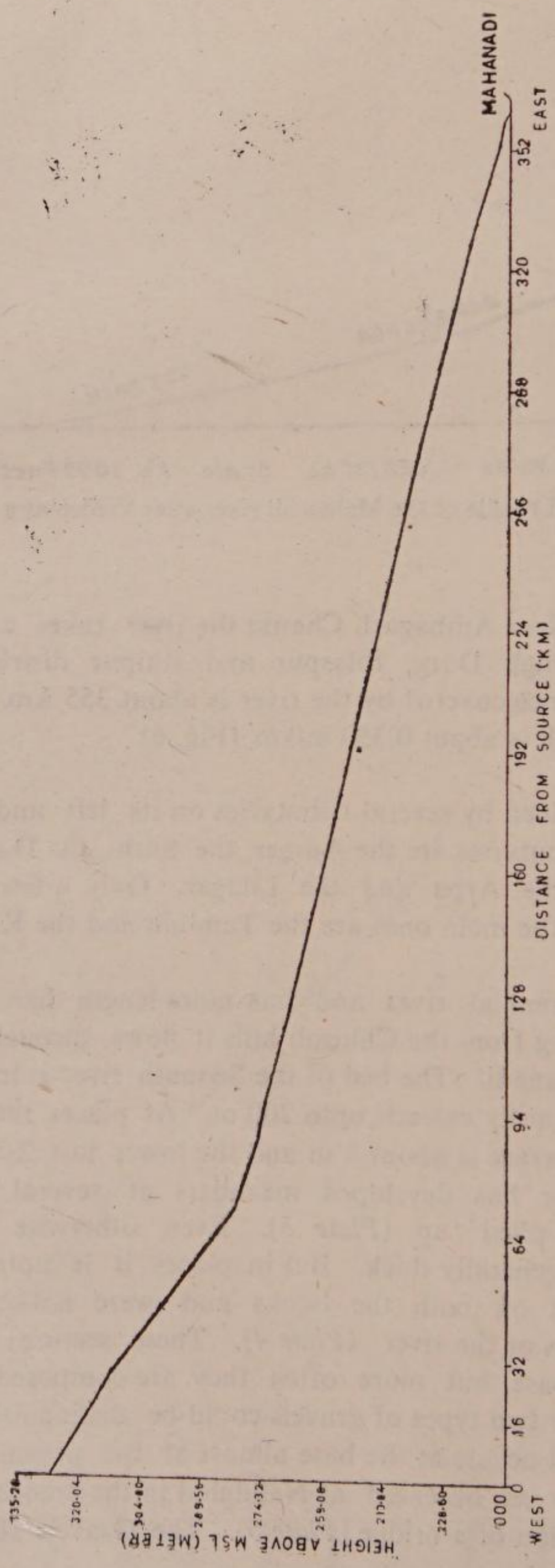



Fig. 6. Longitudinal Profile of the Seonath river

along the banks about 4.5 m above the present river bed. (*Plate 6*). These gravels were generally found resting on the shale rocks. At places, the river has cut through the basal shale beds which are exposed in the form of cliffs overlooking the present river bed. This rejuvenation in the bed may be due to structural causes or weakness of the rock. Adjacent to these cliffed banks are the gravel deposits containing Upper Palaeolithic industries.

## THE HASDO RIVER

The Hasdo rises at about 758 m AMSL near Sonhat in Sarguja district of Madhya Pradesh. From its source the river flows to the south-west until it is joined by Hasia Nadi on the right bank near Mahendragarh. Further the river flows to the south-east and after getting Gaj Nadi on its left at Maria Kachar the river turns to the south. Near Chhatan it takes a sharp turn to the west and from Bango onwards, after receiving Tan Nadi on the right, the river flows south-east and southwards leaving Korba and Champa on the left side. The Hasdo joins the Mahanadi near Mahuadih at 224 m AMSL. The total length of the Hasdo river from its source is about 440 km and its average gradient is 1.210 m/km.

The river, after taking its source from the hills, flows on rocky surface for 184 km through the hills. From Bango onwards the river gets into the plain and widens its bed. The river bed is sandy with low banks hardly exceeding 2-3 m. in height. The alluviation near the banks could not be seen much but it was noticed upto 25 m. thick, 5 km away from the Hasdo river near Seoni. One Middle Palaeolithic and two Mesolithic sites were discovered along this river. The Mesolithic sites were situated at the foot of the hills a little away from the river, whereas the tools of Middle Palaeolithic culture were found in the river bed.

## THE RIVER JONK

The Jonk rises at 600 AMSL from the Sonabera plateau in Kalahandi district of Orissa. The river flows due north and drains the northern slope of Gauragarh plateau (Bhavanipatna) and further it forms the inter-state boundary between Madhya Pradesh and Orissa, dividing Raipur district (M.P.) from that of Kalahandi district (Orissa). Near Kot the river takes a turn to the north-east and passes through the hills of Mahazamund and Baloda Bazar tahsils. The river finally turns to the east before debouching into the Mahanadi near Seorinarayan, at an elevation of about 234 m AMSL. An everage gradient of the Jonk river is 1.464 m/km.

The river mostly flows through a narrow rocky channel. At places this river has preserved thick alluvium, the thickness of which is from 3 to 6 m in the lower reaches, as seen on both the banks. The deposits of Gravel-I were noticed at two places on the Jonk river. At Arjuni the gravel lies below the present river bed and could be seen only in the cuttings of the dam construction (*Plate 8*). The river shows both erosional and depositional features. Near the foot-hills the erosional features are most noticeable whereas depositional features were observed in the middle and lower reaches of the river. The river does not show terrace formation anywhere in its course.

**Geology**

It is generally seen that early man had his settlements at those places where the raw material was readily available for manufacturing the stone tools. The Mahanadi Valley was one of those areas which had favoured the early man in this regard. The geological formations of the area are given below (Fig. 7).

| | |
|---|---|
| 1. Lower-Pre-Cambrian | Archaeans |
| | (a) Dharwar |
| | (b) Granite Gneisses |
| 2. Upper-Pre-Cambrian | Cuddapah |
| | (a) Raipur series |
| | (b) Chandarpur series |
| 3. Triassic and Corboniferous | Gondwanas |
| | (a) Upper Gondwana |
| | (b) Lower Gondwana |
| 4. Gretaceous | Lameta beds |
| 5. Gretaceous Eocene | Deccan Trap with Inter-trappean beds |
| 6. Quaternary | (a) Laterites |
| | (b) Alluvium |
| | (c) Soils |

**Archaeans**

The archaeans are oldest formation in the region. A large tract of the upper Mahanadi valley is occupied by rocks of this system. The archaeans are divisible

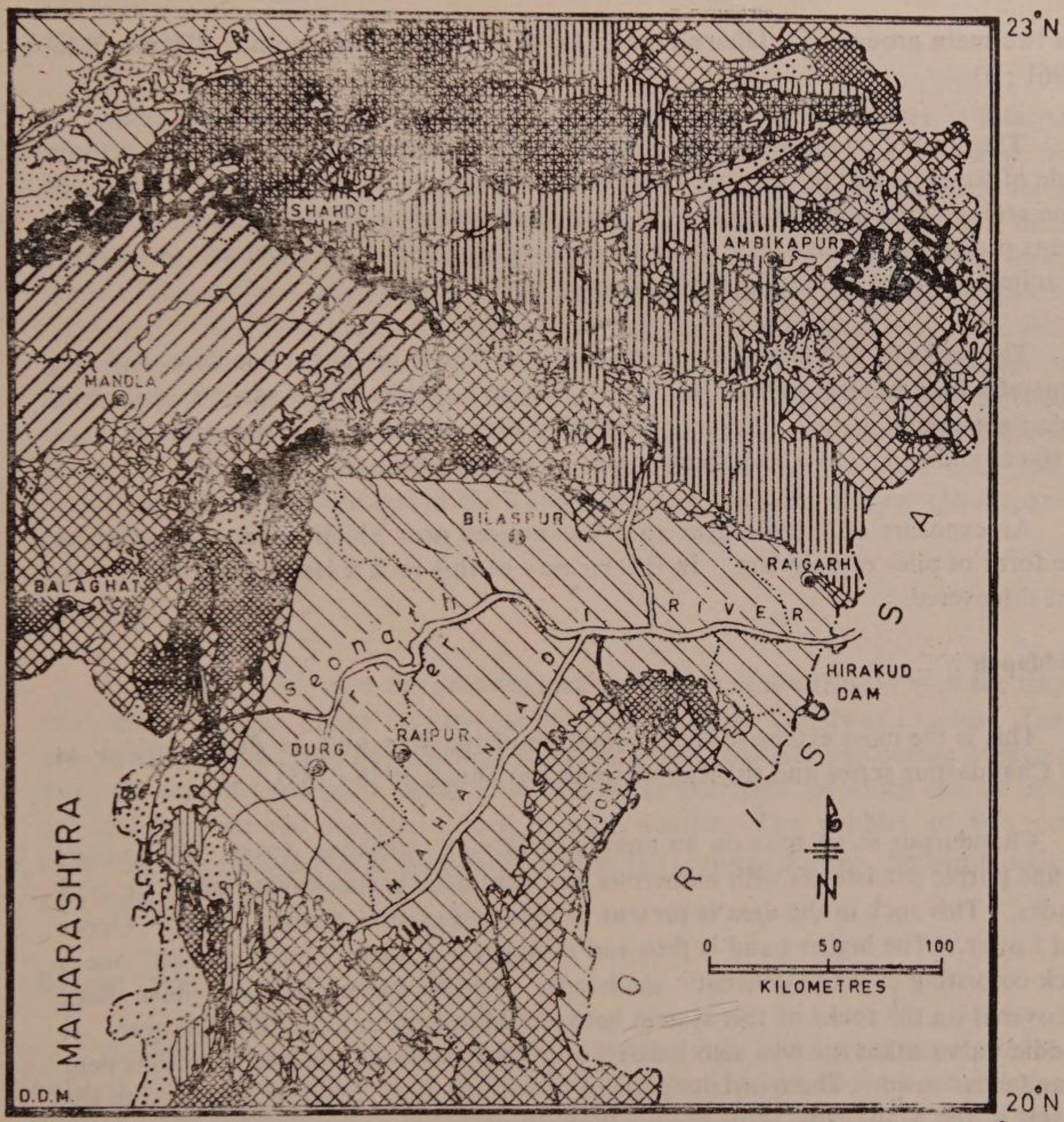



Fig. 7. Geology of the Upper Mahanadi Valley

in two main groups : (a) Dharwars and (b) the Granites and gneisses (Rama Rao, 1961 : 1).

The granite and gneisses occur in the south and south-east of Raipur, northern side of Raigarh and in some parts of Bilaspur districts. The rocks are made of fine grained grey gneisses and coarse porphyritic granites. The intrusions of quartz veins pegmetite, felsite dykes, dolerite, diorites, diabase trap, eucrites or crypto-granite have been noticed in these rocks.

The rocks of this group are found in the form of huge boulders and are generally found everywhere in the valley. These boulders are of various sizes and occur sometimes as tors. Several Mesolithic sites are found on the granitic rock surfaces and some have been found near the quartz veins.

An exposure of dolerite dyke rock was noticed near Bhilai village. It occurs in the form of piles of boulders. In the vicinity of this rock a lower palaeolithic site was discovered.

**Cuddapah**

This is the most extensive rock formation of the area and is distinguished as (a) Chandarpur series and (b) Raipur series (Krishnan 1956 : 185).

Chandarpur series rests on an uneven surface of archaean rocks. It consists of fine purple sandstones with numerous green chloritic grains having pink or buff shades. This rock in the area is present in the form of two distinct bands; Upper and Lower. The higher band is thin and disappears gradually but the lower one is thick consisting of white quartzitic sandstone. Several Mesolithic sites have been discovered on the rocks of this system between Mahasamund and Chandarpur. A Middle Palaeolithic site was also located over these rocks in the low lying hills near Chandarpur town. The quartzite pebbles of various sizes have been noticed in the gravels of the Mahanadi, Seonath and Jonk rivers.

The Raipur series is separated from Chandarpur series by a long stretch of river alluvium. This group is mainly represented by shales and limestones. The shale rock is found exposed at several places in the beds of the Seonath and the Hasdo. At Simga, Nandghat and Amlidih the shale rock is overlain by gravels which yield Upper and Middle Palaeolithic implements. The pebbles of this rock have been encountered at several places in the gravels of the Seonath river. Some of the Upper Palaeolithic open air stations like Simga and Bansankra are situated on the surface covered with fragments of shale rock.

**Gondwanas**

Small spreads of Gondwanas are found to the north of the valley in Bilaspur and Raigarh districts. They overlie the Cuddapah series unconformably and are divided in two main groups : Upper and Lower. The Upper Gondwanas are represented by shales and sandstones etc., and are present in the northern part of Bilaspur district. The Lower Gondwanas are mainly of the Talchir and Barkar series, made of fine grained green sandstone with occasional boulders of quartzite having a dip of 15°-50° in the northeast direction. They occur in isolated exposures within a narrow band running along the foot of the northern hills. The thickness of Korba seems in the Hasdo valley is about 30.5 m. This rock is not found to have been used for manufacture of the implements and no gravel contains the pebble of this rock. But several Lower Palaeolithic and Middle Palaeolithic sites have been found located on the outcrops of the Talchir boulder beds in Orissa (Mohapatra 1962 : 37-50).

**Lametas**

The Lametas rest over the granites and gneisses and are fringed with the trappean hills. At some places they overlie the Talchirs of the Gondwana system. They are represented by gritty and silicious limestones with a small percentage of jasper. The thickness of Lametas is about 15 m, the better examples of which can be seen on the Jonk river and northern side of Bilaspur district. The pebbles of this rock were noticed in the gravel at Arjuni exposed in the cuttings during the construction of a dam.

**Deccan Trap**

This rock formation has been found in western and north-western parts of the valley mostly in the eastern part of the Maikala range in the Durg and Bilaspur districts. The silica group of minerals occurring in the trap rocks as cavity fillings were exploited by Middle Palaeolithic, Upper Palaeolithic and Mesolithic populations. The pebbles of chert, jasper, chalcedony and agate have been noticed in the gravels and the Seonath river bed.

**Laterites**

In the upper Mahanadi, the laterites occur in patches and rest over the Cuddapah rocks. During field studies such patches were observed near Bhilai in Durg district, near Mahasamund, Tumgaon, Macheva in Raipur district and near

Pujaripali in Raigarh district of Madhya Pradesh. A Mesolithic site over the laterite surface was located at Macheva village near Mahasamund town.

**Alluvium**

The entire Chhattisgarh basin is a great alluvial tract. The alluvium is composed of gravels, sands, silts and clays and is mainly confined to the modern channels. The alluvial cover is generally thin and rests on the Cuddapah rock formation. At a few places, the alluvium is nearly 25 m. thick. In the Seonath and Jonk rivers the alluvium is comparatively thicker than that in the Mahanadi. Sometimes the older alluvium is replaced by younger one and the distinction between them is not always very clear. In general the older alluvium is more coarse and compact than the younger alluvium.

The Middle Palaeolithic, Upper Palaeolithic and Mesolithic tools as well as some animal fossils are found in the section of alluvial deposits at several places.

**Soils**

The soils of the upper Mahanadi plain vary according to the topographic situations and underlying rocks. Mainly three types of soils could be distinguished the dominant among which are the red soils. (Fig. 8A). Light coloured soils are seen along the rivers. The soils of the upper Mahanadi could be divided in five subgroups. They are as follows :

(a) Bhata is sandy gravelly soil, occurring on the uplands having red colour and coarse texture. The Bhata lands are less fertile due to washing away of their productive minerals and organic material. Thus the areas having this type of soil are suited for industrial activities.

(b) Kanhar is a deep and dark brownish soil generally found in low lying places. This soil is different from black-cotton soil (the soil generally found in the Basalt and Deccan Trap areas).

(c) Matasi is a clayey yellow and sandy soil occurring on higher and better drained areas. This is also suitable for crops, specially for rice.

(f) Dorsa is an intermediate type between Kanhar and Matasi and has been considered as a loamy soil of yellow and brown colours. The soil is suitable for all types of crops.

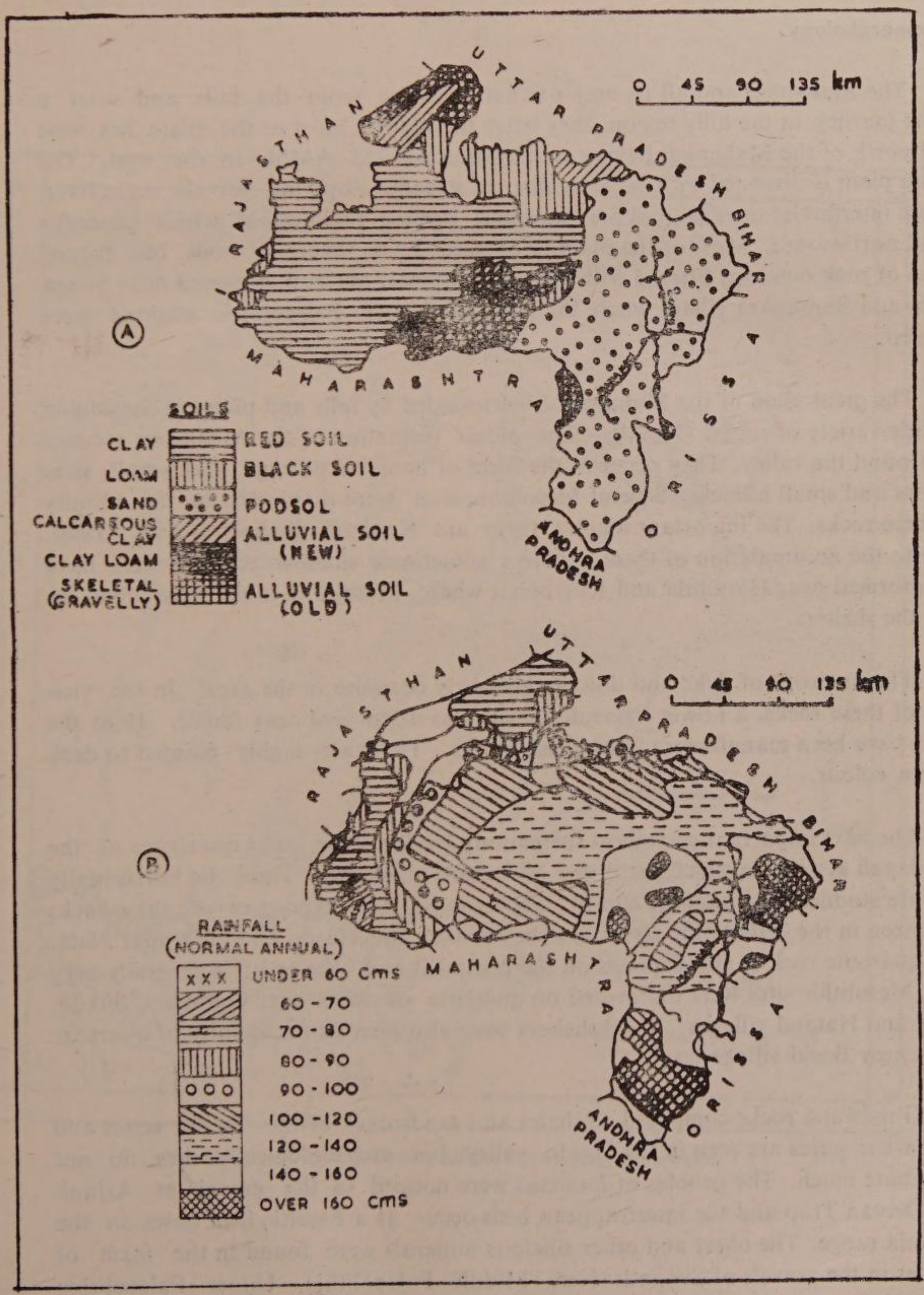



Fig. 8. Different soils of the upper Mahanadi Plain

## Geomorphology

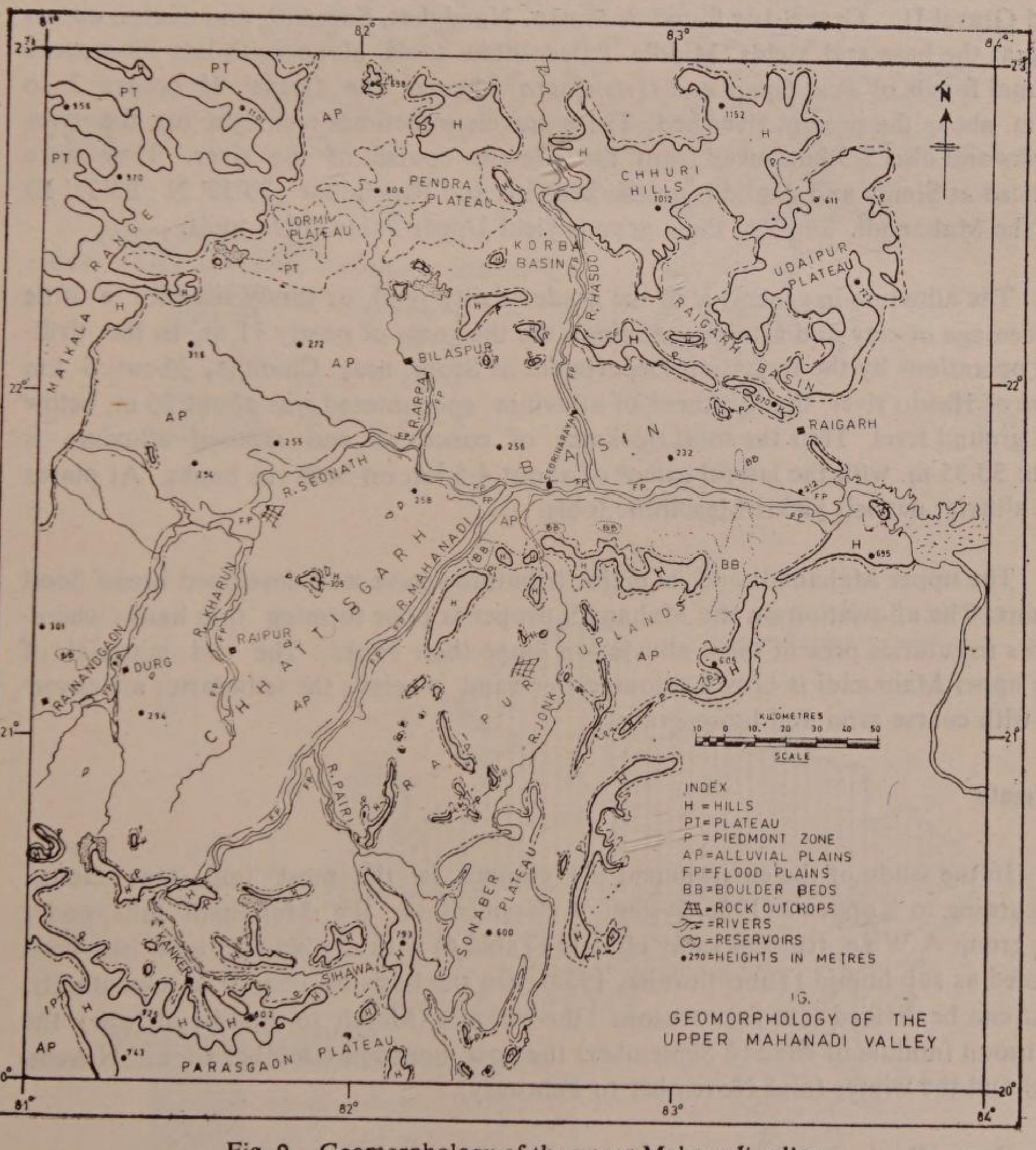
The Mahanadi and all its major tributaries rise from the hills and after a short journey in the hilly region, they enter the plain. Most of the plain lies west and north of the Mahanadi having an elevation of 212 AMSL in the west. The entire plain is dissected by a large number of streams emptying into the main river. These interfluvial interesectors present slight surface undulations which generally trend north-south. Most of the plain is covered by a veneer of soils but rugged areas of rock outcrops littered with wheathered pieces are also observed near Simga town and Bansankra village where the open air Upper Palaeolithic stations were located.

The great plain of the Mahanadi is surrounded by hills and plateaus containing a large variety of rocks. (Fig. 9). The oldest formation of the Archaeans are met all around the valley. They occur in the form of boulders of huge and small sizes as tors and small hillocks. Several Mesolithic sites were discovered in the vicinity of these rocks. The important among them are Kankar, Shahwara and Araud. Due to the accumulation of these boulders sometimes shallow rock shelters have been formed near Haradula and Kurrubhat where Mesolithic tools were found inside the shelters.

The outcrops of dyke and dolerite are fairly common in the area. In the vicinity of these rocks, a Lower Palaeolithic site was discovered near Bhilai. Here the tools have been manufactured on these rocks. They are highly painted to dark brown colour.

The next important geological formations are the shale, and quartzites of the Cuddapah system on which the upper Mahanadi plain rests. These lie horizontally and are studded with shallow cup-like depressions. The exposures of these rocks were seen in the beds of the rivers like the Seonath, the Hasdo and the Kudar Nala. The quartzite rock is also exposed on the pediment and the relief is generally very low. Mesolithic sites were discovered on quartzite outcrops near Garaghat, Sukda, Borsi and Hataud villages. Rockshelters were also seen in the vicinity of quartzite rocks near Borid village.

Gondwana rocks composed of shales and sandstones of the Talchir series and the Barkar series are seen in the Hasdo valley but archaeologically they do not contribute much. The pebbles of Lametas were noticed in the gravel at Arjuni. The Deccan Trap and the intertrappean beds occur as a baseltic lava flows in the Maikala range. The chert and other silicious minerals were found in the form of pebbles in the gravels of Seonath river. Middle Palaeolithic, Upper Palaeolithic




IG.
GEOMORPHOLOGY OF THE
UPPER MAHANADI VALLEY

Fig. 9. Geomorphology of the upper Mahanadi valley

and Mesolithic tools were manufactured on these rocks. A single Mesolithic site was found on the lateritic deposit near Macheva village.

In the upper Mahanadi valley two gravel formations are noticed as Gravel-I and Gravel-II. Gravel-I is found at Simga, Nandghat, Somnath and Katgi, occurring at the base and yields Middle Palaeolithic tools along with late Pleistocene animal fossils of *Bos*, *Equus* and *Ovis/Capra* whereas the Gravel II occurs 3 to 15 m. above the present river bed. These gravels sometimes rest right on the river banks and also 2-3 km. away from the present course of the river. They were noticed at Simga and Amlidih on the Seonath and Panchdhar (20°39′ N : 83°21′ E) on the Mahanadi. Some of these gravels yield Upper Palaeolithic tools.

The alluvium in general is of the grade of silty sand or sandy silt with a little percentage of clay and attains sometimes the thickness of nearly 11 m. In the drilling operations by the Irrigation Department at Seoni near Champa, about 5 km west of Hasdo river, the thickness of alluvium encountered was about 25 m. below the ground level. Thus the total thickness of concealed and exposed alluvium is upto 30-35 m. with the lateral extent of about 4-5 km on both the banks. At places the alluvial deposit yields Mesolithic tools.

The upper Mahanadi and its major tributaries have well developed broad flood plains. The alluviation on the Mahanadi proper is poor forming thin banks whereas its tributaries present thick alluviation along their banks. The bed material of the upper Mahanadi is brown coloured fine sand whereas the tributaries are covered with coarse sand and loose gravels.

**Climate**

In the study of the environment the climate is the most important factor. According to Koppen's (1936) system of classification, the Mahanadi falls under the group A W i.e. tropical rainy climate (Table 6) with dry winters and has been classed as sub-humid (Thornthwaite, 1933). On the basis of change in climate, the year can be divided into four seasons : the summer (March to middle of June) the monsoon (middle of June to September) the post monsoon (October to mid November) and the winter (mid November to February).

Generally the hot season sets in the month of March when the temperature starts rising which continues upto the middle of June. May is the hottest month of the year and sometimes temperature shoots up to 45.7°C. In May and early June hot scorching and dust raising winds blow. During these months the soil is effectively dried and all the vegetable shrivels under the burning sun and strong hot wind

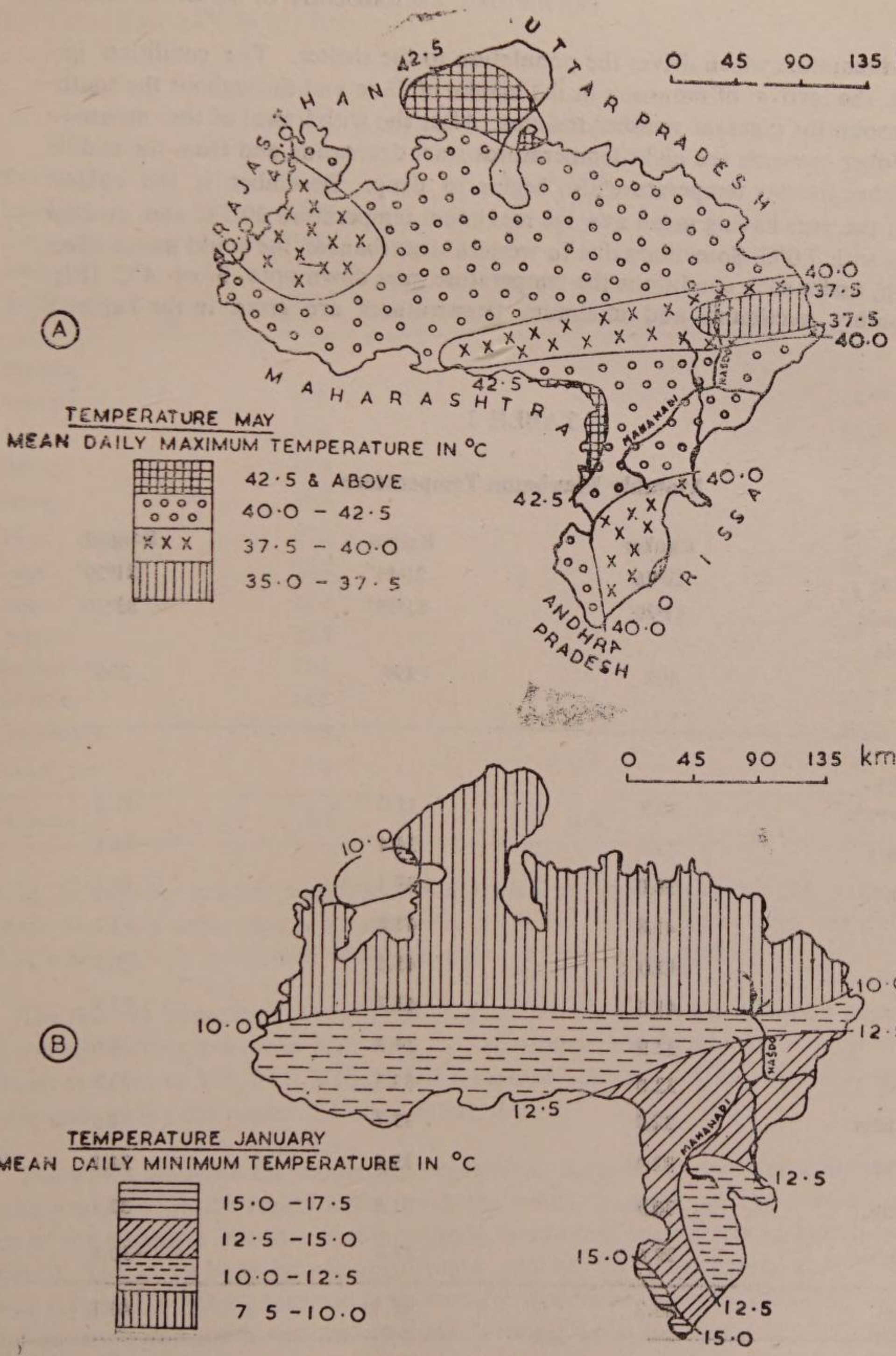



**Fig. 10. Maximum and Minimum Temperatures**

creating discomfort which drives the population to the shelter. The condition improves at the arrival of monsoon in the middle of June and throughout the south-west monsoon the pleasant weather remains. After the withdrawal of the monsoon from October onwards the night temperatures start decreasing and from the middle of November the day temperature also begins to drop. December is the coldest month of the year having mean average maximum temperature 30.5°C and average minimum with 7.0°C. Sometimes due to western disturbances, the could waves affect the region, under such conditions the temperature goes down upto 3 or 4°C (Fig. 10). Monthly maximum and minimum temperatures are given in the Tables 1 and 2.

TABLE 1

**Monthly Maximum Temperature**

| Station | Kanker | Raipur | Raigarh |
|---|---|---|---|
| Latitude | 20°16′ | 21°14′ | 21°50′ |
| Longitude | 81°29′ | 81°39′ | 83°20′ |
| Altitude AMSL | 402 | 298 | 236 |
| Months | | | |
| January | 30.9 | 31.0 | 31.2 |
| February | 33.6 | 34.4 | 36.1 |
| March | 38.0 | 39.1 | 40.2 |
| April | 41.8 | 42.8 | 43.7 |
| May | 43.0 | 45.1 | 5.7 |
| June | 41.3 | 43.7 | 43.9 |
| July | 32.9 | 34.9 | 35.6 |
| August | 32.0 | 33.3 | 33.9 |
| September | 32.4 | 33.7 | 34.3 |
| October | 32.4 | 33.6 | 34.1 |
| November | 30.9 | 31.8 | 32.1 |
| December | 29.6 | 29.8 | 30.5 |
| Annual | 43.2 | 45,4 | 46.1 |

TABLE 2

**Monthly Minimum Temperature OC**

| Station | Kanker | Raipur | Raigarh |
|---|---|---|---|
| Latitude | 20°16′ | 21°14′ | 21°50′ |
| Longitude | 81°29′ | 81°39′ | 83°20′ |
| Altitude AMSL | 402 | 298 | 236 |
| Months | | | |
| January | 7.2 | 9.5 | 8.9 |
| February | 9.0 | 11.4 | 11.2 |
| March | 13.1 | 15.7 | 15.1 |
| April | 18.8 | 20.2 | 21.3 |
| May | 22.2 | 24.1 | 24.7 |
| June | 21.7 | 22.3 | 23.3 |
| July | 21.4 | 21.7 | 22.8 |
| August | 21.9 | 21.9 | 23.1 |
| September | 21.1 | 22.0 | 22.7 |
| October | 14.9 | 17.1 | 17.7 |
| November | 9.6 | 12.0 | 12.2 |
| December | 7.0 | 9.7 | 9.7 |
| Annual | 6.1 | 8.8 | 8.3 |

In the summer seasons the plains are hot and scorching whereas the valleys, uplands and hilly areas are cooler and more pleasant. But in the winter the hills and uplands become fairly cold while the plains are pleasantly cool.

The relative humidities (Table 3) are higher in the south-west monsoon season and sometimes they are more than 86%. In the summer the humidity is very low and comes down to 35% as it is the driest season of the year. After the monsoon season and during the winter the air is rather dry.

The winds influence the monsoon, vegetation, nature of the landscape and human activities. In the region under study the winds increase at the commencement of the monsoon but they become speedy as summer season sets in March (see Table 5). The winds blow between north and east in the post-monsoon and the winter seasons. In March they are from variable directions and by April they come from the south and south east and continue blowing from the same direction upto September.

TABLE 3

**Relative Humidity (%)**

| Station | Kanker | Raipur | Raigarh |
|---|---|---|---|
| Latitude N | 20°16′ | 21°14′ | 21°50′ |
| Longitude E | 81°29′ | 81°31′ | 83°20′ |
| Altitude AMSL | 402 | 298 | 236 |
| Months | | | |
| January | 72 | 62 | 65 |
| February | 67 | 55 | 53 |
| March | 54 | 41 | 43 |
| April | 46 | 36 | 38 |
| May | 43 | 35 | 41 |
| June | 64 | 61 | 61 |
| July | 82 | 85 | 85 |
| August | 86 | 86 | 86 |
| September | 82 | 82 | 83 |
| October | 79 | 73 | 74 |
| November | 75 | 63 | 63 |
| December | 73 | 62 | 64 |
| Annual | 69 | 62 | 63 |

TABLE 4

**Mean Wind Speed (km/hr)**

| Station | Kanker | Raipur | Raigarh |
|---|---|---|---|
| Latitude | 21°16′ | 21°14′ | 21°50′ |
| Longitude | 81°21′ | 81°39′ | 83°20′ |
| Altitude AMSL | 402 | 298 | |
| Months | | | |
| January | 2.2 | 5.8 | 4.0 |
| February | 3.7 | 6.0 | 4.4 |
| March | 5.5 | 6.9 | 4.8 |
| April | 6.7 | 8.4 | 5.3 |
| May | 8.3 | 1.7 | 6.3 |
| June | 9.7 | 12.1 | 7.3 |
| July | 10.0 | 1 .8 | 7.0 |
| August | 8.2 | 10.4 | 6.5 |
| September | 6.0 | 7.4 | 5.3 |
| Octob r | 3.5 | 6.0 | 4.4 |
| November | 3.0 | 4.1 | 3.8 |
| December | 2.3 | 4.4 | 3.2 |
| Annual | 5.8 | 7.8 | 5.2 |

TABLE 5

**Monthly Total Rainfall (mm)**

| Station | Kanker | Raipur | Raigarh |
|---|---|---|---|
| Latitude | 20°16′ | 21°14′ | 21°50′ |
| Longitude | 81°29′ | 81°39′ | 83°20′ |
| Altitude AMSL (m) | 402 | 298 | 236 |
| Months | | | |
| January | 8.7 | 12.9 | 18.4 |
| February | 17.5 | 20.4 | 15.5 |
| March | 25.6 | 23.3 | 21.0 |
| April | 27.0 | 15.1 | 7.5 |
| May | 24.8 | 16.8 | 13.7 |
| June | 204.5 | 193.6 | 167.7 |
| July | 359.0 | 391.0 | 475.2 |
| August | 359.2 | 396.6 | 507.7 |
| September | 257.0 | 249.4 | 341.4 |
| October | 97.2 | 62.4 | 56.9 |
| November | 12.9 | 7.8 | 0.7 |
| December | 1.4 | 1.8 | 1.3 |
| Annual | 1394.8 | 1388.2 | 1627.0 |

**Rainfall**

The rainfall is well distributed in the area (Fig. 8B). During the monsoon season the area receives about 80% of the total rain which mostly occurs from June to September. The months of July and August receive the largest rainfall in a year. The rainfall varies from place to place due to orographic influences. To see the variation in different areas Kanker, Raipur and Raigarh rain gauge records for thirty years (1931-60) have been taken into consideration. The details of which are given in Table 6. The Raipur is situated in the heart of the plain whereas Kanker and Raigarh are the two extreme southern and northern hilly areas. The average rainfall record in the region is of the order of 1300 mm per annum. In the Seonath valley the distribution of rainfall is comparatively less (1000-1200 mm) whereas it increases over the Raigarh hills and goes upto 1600-1700 mm. The uplands of Kanker to the south and east receive about 1400 mm average rainfall. The periodic rainfall variation is evident from last 100 years. The mean highest rainfall recorded in 24 hours is 370.3 mm on August 4th 1910 around Raipur.

**Flora and Fauna**

Vegetation and animal life are an integral part of each other and various

TABLE 6

**Agroclimatic Classification of Madhya Pradesh East**

| *Station* | *Potential* | *Summer Concentration* | *Precipitation* | *Water surplus* | *Water deficiency* | *Humidity India IH* | *Aridity India IA* | *Moisture India IM* | *Climatic type* |
|---|---|---|---|---|---|---|---|---|---|
| Kanker | 1490.4 | 36.9 | 1627.0 | 937.5 | 802.4 | 62.8 | 53.3 | 9.0 | C2A 'W2a' |
| Raipur | 1597.0 | 37.8 | 1388.2 | 640.4 | 848 7 | 40.1 | 53.1 | 13.0 | C1A 'S2a' |
| Raigarh | 1452.2 | 36.6 | 1394.8 | 625.8 | 682.6 | 43.0 | 47.0 | 3.9 | C1A 's2a' |

C1A =Dry sub-humid climate;
C2A =Moist sub humid climate;
s2a' =Long summer water deficiency;
W2A =Long winter water deficiency.
(After Rao *et al.* 1972).

types of animals derive food from living and dead plant material and form an important link in circulation of nutrients in the biome (Puri, 1960: 623).

Physiography, including soils and climate, is an important factor for controlling the distribution of p'ants and animal life. As has been mentioned earlier the Mahanadi plain is surrounded by hills and plateaus. These hills and plateaus are traversed by several streams, rivers, rivulets and springs etc. which ensure a permanent water supply in the areas even today. This has helped to grow the thick vegetation holding an impressive array of plant and animal life.

**(a) Flora**

The natural vegetation over the greater part of Madhya Pradesh is generally found in the forests. The forests are mostly distributed on the hill tops, slopes and also foot of the hills in the valleys. The Mahanadi valley also does not present a different picture in this regard. The vegetation type in this region is tropical moist deciduous forests characterised by sub-humid monsoonic climate. Due to sufficient rainfall, productive soil, great heat and humidity, the area is rich in vegetation and has prolific growth of it. Some vegetation types also grow in the rainy season and go dry in the summer due to the scorching heat. Generally the trees shed their leaves in order to escape desiccation only in the summer season. Though in the recent years due to continued exploitation and maltreatment of points for centuries by man and his domesticated animals, the forest climaxes have been destroyed (Puri, 1960 : 1), yet the area still preserves thick vegetation. According to the types of trees and plants, these have been divided in several groups and have been discussed in the following pages.

**Fruit and flowering trees**

The trees of this variety occur in the open land and forests being more common in and around the villages. Among these are :

*Mangifera indica* linn; pipal
*Cassia fistula* linn; Amattus or Dhanbohara.
*Zezyphus mauratiana*, lionk; Ber
*Tamarindus indica*, linn; Tamarind
*Salmolia malabarica* (D.C.) Schott and Endlo; Semal
*Azalerachla indica*; Neem

Most of these trees bear edible fruits and flowers which are a source of food even today.

**Wild trees**

The trees of this group generally abound in the forests of the area but in the recent decades a few of these species have been domesticated and can be seen in the open and plain land. Sal (Shorea robusta) is the predominant species in the forests of the valley and covers a large area with its several sub-species. The other wild trees in the forests are :

*Deospyros melanoxyeon* Roxb; Tendu (kendu)
*Terminalia chebula* retz Harra
*Terminalia belerica* Roxb; Behera
*Spondias pinnatu* (Linn F) kutz; Amra (Amera)
*Butea monosperma* (Lamk) Taub
*Anogeissus latifolia* wall; Dhaora
*Lagerstroemia parviflora* Roxb; Seja (senha)
*Qugenia lojeienens* (Roxb) Hechreut; Tinsa (Bandran)
*Pterocarpus marsupium* Roxb : kumbhi
*Boswellia serratta* Roxb : Salai (Saliha)
*Sterculia urens* Roxb : kulu (kauagundra)
*Acacia catechu* wild : khair
*Soymida febrifoga* Juss : Rohna (Rahina)
*Zizyphus rylopyra* Hilled : Ghont

The forests are also rich in varieties of bamboos. The chief among them are :

*Bambusa tulda* Roxh; Desibans
*Dendrocalamus strictus* Nees; Bans (Paharibons)

**Shrubs**

This group is characterised by small plants and varieties of shrubs and is mainly represented in the uplands and hilly areas. Seeing the utility of the plants, these have been divided in two sub groups :

(a) Medicinal plants
(b) Fruit plants

**(a) Medicinal plants**

These plants are mainly distributed in the forests and come under Gardenias. The species of medicinal plants are represented by *Gardenea turgida* Roxb; phetra

(kharhar) *Gardenia latifolia* Ait; Dongarsuru, *Gardenia bucida* kuru and *Gardenia gamiferia* Gumkuru. All these plants are used for medicinal purposes.

**Fruit plants**

Allied to Gardenias, some Gravia species are also found in the forests. These are *Rendia dumitorum* Lomk, Mainphal (Mauna), *Rendia uliginosa* tilka, *Wendlendia exserta* DC, Tilwan (Talai) *Butea frondosa* parsa or pagsi, the flume of the forests, *Grawia indica* dhaman the lance wood tree. The fruits of these species are being exploited by tribal people even today.

**Watery plants**

The vegetation of this type exists in the ponds, lakes, streams and rivers. The important species are *Sesbania acculiata*, Dhundhana, *Eschinops echinatus*; kunta; *Nelimbium*, kamal and *Trapo bispinosa* singkara or water nut.

Varieties of climbers, orchids and grasses are also abundant in the area. Among the important ones are *Cuscuta reflexa* Roxb, Amarbel; *Butea superba* roxb. Palasbel (Dodranage) Mucuna Prurita Hook, kewach (Kimach); *Cynodon dactylon* Pers, Doob; *Chloris incompleta* Roth *Sacchrum spontaneum* linn, kons etc.

The area is dominated by agricultural products and livelihood of the bulk of the population is derived from agriculture mainly. The cultivated crops in the upper Mahanadi valley include several types of cereals, pulses, pulsus, oil seeds crops and varieties of vegetables. *Orijza sativa* linn. Rice is the most important crop and is being cultivated dominantly. Several other crops such as *Trtticum sativum* lom wheat (gehu); *Andropogon sorghum* Bret, Jwar or bajri, *Cicer dritienum* Land, Gram also form an important place in vegetarian diet. Pulses are also being cultivated in sufficient quantity and form major food type in the area. These are mainly of three types such as *Cajanus indicus* spreng, Tur, *Phaseolus munga* Linn and *Phaseolus radiatus* Linn, mung; Oil seeds are comparatively less produced. The common varieties of these are *Arachis hypogea* Linn; Groundnut; *Brassiea* juneca HF and T. Mustard and *Sisamum indicum* Linn, Til.

Varieties of vegetables are also grown. The common among these are *Solomum dulkamara* Linn potato; *Allium capa* Linn, Onion; *Ipo batatas Pir*, sweet Potato; *Lycopersium esculentum*. Tomato; *Brassica obracea* Linn; Cabbage; *Brassica oleracea botytis* cauliflower and several leafy vegetables.

The quaternary deposits of the Mahanadi have not so far yielded any floral remains in the form of plant fossils or pollen grains. The above details of the

present vegetation are however an ample proof that there are several varieties of trees which can provide sufficient food requirements. Even in the severe drought the population of the area can sustain though for a limited period, on this vegetable food. Since there is no evidence of drastic climatic change in the prehistoric past, the vegetation pattern might have been more or less the same as of today. Thicker vegetation cover and less human population during the Stone Age must have made this region suitable for habitation.

**(b) Fauna**

The monsoon forests having vivid topography interfringed with small streams and rivers provide an ideal abode for wild life in the upper Mahanadi valley. Animal hunting was common among the kings during ancient times. Although the forests are declared as Reserve forests and hunting is strictly prohibited to save the wild life the tribal people still hunt the animals with the help of bows and arrows which form an important source of non-vegetarian food to them. These activities and the clearance of forests in the recent time in the region have certainly reduced the wild animals to a great extent. Even then varieties of fauna still abound the valley. The following are the more important among them.

*Panthera tigris* Linnaves, Tiger (Bagh)
*Panthera parolus* hennaeus, Leopard (Chita)
*Bubalus bubalis* Linnaeus, wild buffalo (Arna)
*Boseaplus gecamdus* Pallas, Nilgai
*Tetracerus quadricornis* Blainuille. Four horned antelope (chowsingha)
*Gazella gazella* Pallas, Chinkara
*Antelope cervicapra* Linnaeus, Blackbuck (Haina)
*Cervus muntjac* Zimmermana, Barking deer
*Axis axis* Ecrxleben, spotted deer
*Cervus duvauceli* Cuvier, Swamp deer (Barasingha)
*Cervus unicolor* kerr Sambar
*Melursus ursinus* shaw, sloth bear (bhalu)

are among the large games found in the valley.

The smaller games are :

*Canis lupus* hennaeus, Holf (Hurar)
*Sus scrofa* hennaeus, Boar (suar)
*Canis aureus* hennaeus, Jackal (Gidhar)
*Vulpes bengalensis* show Indian fox (lomri)

*Lutra lutra* Linnaeus, Ud
*Hyaena hyaena* Linnaeus, Hyaena
*Macaca radiata* Geoffroy, Monkey (Bandar)
*Presbytis entellus* Dufresne, Langur
*Lepus nigricollis* F. Cuvuer, Hare (khargosh)
(khargosh) *Herpestes auropunetatus* Hodgson,

Indian Mongoose, *Felis chaus* Guldenslaedt, Jungle cat (Banbilar) *Funambulus palmarum* Linnaeus, Tree Striped plain squirrel, *Rattus rattus* Lennaeus, Common house rat, *Mus booduga*, Grey field mouse are the common varieties which are found both in plains and hilly areas.

There are a large number of birds commonly met with in the valley. Some of them noticed in the forests are *Pavo cristatus* Linnaeus, Peafowl; Gallus sommeratu Temminck, Grey jungle fowl; *Pterocles exustus* Temm and Laug, sandgrous; *Francotinus pictus*, Jardin and Selby, Paited patredge; *Gocopus phoenicepterus* Latham, Green pigeon; *Columba linia* Gmelin, Blue rock pigeon and *Coturnix coturnix* Linnaeus, Grey quail.

*Passer domesticus* Linnaeus, House sparrow; *Corvus splendens* viullot, House crow; *Acridotheras tristis* Lennaeus, Myna are seen around the human dwellings. A few species of *Chloropsis olovompsa*, Bulbul can be seen in the gardens; *Ploceus philppinus* Linnaeus, koel is heard in the mornings of summer season; *Hierocaeceyx varius* vahl. Brain feuer (Papeeha) is also seen in the early rainy seasons.

Apart from rivers and streams the area also abounds in ponds having varying capacity of water. Some of these rivers, streams and ponds go dry in summer but there are some which preserve water throughout the year in which several varieties of fishes are found. The major carp fishes among these include :

*Catla catla* katla
*Lambeo rohita* Rohu
*Cerrhina mrigala* Mirgal
*Silondio silondia* selond
*Wallagonia attu* attu and
*Mystus senghala* singhan

These rivers and ponds are also rich in varieties of tortoises, toads, crabs, mantids, molluscan shells and insects etc.

Larger vertebrates are not found in the area in the prehistoric past when the natural vegetation was thicker than the present. However, many of this wild fauna must have been present. The fossils of these animals unfortunately have not been found in the upper Mahanadi valley but their existence in the Stone Age times is very well established by the fossils found in the adjacent Narmada valley. As regards the cattle and horse which are fairly common in the upper Mahanadi today were also present in the Middle Palaeolithic times as is evidenced by the fossils of these animals recovered from the Seonath river.

CHAPTER 2

# Discovered Sites, Quaternary Stratigraphy and Palaeontology

## A. Stone Age Sites and Quaternary Stratigraphy

*"Beyond the pale of history, time becomes a relative concept only, dealt with by approximate methods of stratigraphic and "absolute" dating and with the philosophy of the geologist rather than of the historian"*

K. Butzer, 1964 : 13

The field study was carried out in four short field seasons lasting about eight months from 1963-1979. During the course of field work the Mahanadi and its important tributaries like the Seonath, the Hasdo and the Jonk in Bastar, Durg, Rajnandgaon, Raipur, Bilaspur and Raigarh districts of Madhya Pradesh were thoroughly explored. As a result of this exploration a Stone Age cultural sequence right from Lower Palaeolithic to Mesolithic was brought to light. Here are given the details of the sites discovered in the upper Mahanadi valley and the quaternary stratigraphy worked out on the basis of the study of several sections along the river and its tributaries.

## SITES

All the rivers have preserved cultural material (Fig. 11). The Mahanadi yields Lower Palaeolithic, Middle Palaeolithic and the richest Mesolithic stations; the Seonath contains Middle and Upper Palaeolithic; the Hasdo yielded Middle and Mesolithic, and in the Jonk the evidence were obtained only of Mesolithic culture. In all these rivers, the tributaries such as the Seonath, the Hasdo and the Jonk have preserved good stratigraphical records of quaternary deposits whereas on the proper Mahanadi only a few alluvial sections were visible. On the basis of evidence available from all these river valleys, attempts have been made to understand the Stone Age habitations and quaternary stratigraphy of the upper Mahanadi valley.

A detailed description of the sites will be given in the following pages. These sites are described on the basis of their occurrences along the river valleys and are arranged from source to downstream on each river (Table 7).

### (a) Sites on the Mahanadi river

*Kanker* (20°16′ N: 81°29′E (23.5.1979)

Kanker, the northernmost tahsil of Jagdalpur district is situated at the foot of the hills of the Raipur-Jagdalpur road. The Dudh nadi, a small northerly flowing tributary of the Mahanadi, flows through the town and about 4 km. further north meets the Mahanadi near Daspur village. In the southeast, about a km. upstream from Kanker, a Mesolithic site was discovered on the right bank of the Dudh nadi at the base of the granite hill.

The site is situated on the rocky granitic surface near the village cemetery. It measures nearly 30 × 20 m. The raw material utilized for manufacture of the tools is mainly quartz but the tools are also found on the chert material. All the tools are fresh and show no signs of rolling.

TABLE 7

**Sites on the Rivers**

| *Name of the site* | | *Longitude* | *Latitude* | *District* | *Survey of India Sheet No. 1″=1 mile* |
|---|---|---|---|---|---|
| 1 | | 2 | 3 | 4 | 5 |
| **Mahanadi River** | | | | | |
| Kanker | KNR | 81°28′ | 20°16′ | Bastar | 64 H/ |
| Shahwara | SHR | 81°29′ | 20°23′ | ,, | 64 H/6 |
| Khairkhera | KKR | 81°24′ | 20°24′ | ,, | 64 H/6 |
| Amlipara | ALR | 81°25′ | 20°24′ | ,, | 64 H/6 |
| Jhipatola | JPL | 81°27′ | 20°26′ | ,, | 64 H/6 |
| Araud | PRD | 81°27′ | 20°26′ | ,, | 64 H/6 |
| Tanhkapar | TKR | 81°27′ | 20°27′ | ,, | 64 H/7 |
| Haradula | HDL | 81°26′ | 20°28′ | ,, | 64 H/7 |
| Bhilai | BLI | 81°23′ | 20°31′ | ,, | 64 H/6 |
| Ponr | PNR | 81°23′ | 20°32′ | Durg | 64 H/6 |
| Batrel | BTL | 82°06′ | 21°34′ | Raipur | 64 J/12 |
| Macheva | MCN | 82°06′ | 21°06′ | ,, | 64 K/4 |
| Paterapali | PTL | 82°06′ | 21°08′ | ,, | 64 K/4 |
| Mahasamund | MSD | 82°07′ | 21°07′ | ,, | 64 K/4 |
| Kaunkera | KNR | 82°07′ | 21°20′ | ,, | 64 K/4 |
| Jogideepa | JDP | 82°15′ | 21°14′ | ,, | 64 K/4 |
| Bor:d | BRD | 82°16′ | 21°24′ | ,, | 64 K/7 |
| Barbaspur | BBR | 82°17′ | 21°26′ | ,, | 64 K/7 |
| Sukda | SKD | 82°18′ | 21°28′ | ,, | 64 K/7 |
| Bhandora | BNR | 82°19′ | 21°28′ | ,, | 64 K/7 |
| Putpura | PTR | 82°19′ | 21°31′ | ,, | 64 K/7 |
| Pairagura | PRR | 82°19′ | 21°30′ | ,, | 64 K/7 |
| Turibhatha | TBH | 82°20′ | 21°31′ | ,, | 64 K/7 |
| Parsada | PSD | 82°21′ | 21°32′ | ,, | 64 K/7 |
| Nandania | NDA | 82°21′ | 21°31′ | ,, | 64 K/7 |
| Borsi | BRS | 82°22′ | 21°33′ | ,, | 64 K/7 |
| Bagar | BGR | 82°24′ | 21°33′ | ,, | 64 K/7 |
| Hataud | HTD | 82°26′ | 21°35′ | ,, | 64 K/7 |
| Chandarpur | CDR | 83°14′ | 21°43′ | Bilaspur | 64 D/2 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| **Seonath River** | | | | |
| Rajnandgaon | RDN | 81°01′ | 21°06′ | Rajnandgaon | |
| Somnath | SMT | 81°48′ | 12°34′ | Raipur | 64 G/10 |
| Simga | SMG | 81°42′ | 21°37′ | ,, | |
| Bansankra | BSR | 82°36′ | 21°36′ | ,, | 64 G/10 |
| Nandghat | NDG | 81°48′ | 21°01′ | Bilaspur | 64 G/13 |
| Amlidih | AML | 81°55′ | 21°48′ | ,, | 64 G/13 |
| **Hasdo River** | | | | |
| Birtere | BRR | 02°41′ | 22°09′ | Bilaspur | 64 J/12 |
| Korba | KRB | 82°43′ | 22°21′ | ,, | 64 J/11 |
| Katghora | KGH | 82°33′ | 20°30′ | ,, | 64 J/11 |
| **Jonk River** | | | | |
| Sankra | SKR | 82°17′ | 21°39′ | Raipur | 64 K/11 |
| Girod | GRD | 82°34′ | 21°37′ | ,, | 64 K/10 |
| Arjuni | AJN | 81°44′ | 21°40′ | ,, | 64 K/10 |
| Katgi | KTG | 82°31′ | 21°39′ | Raipur | 64 K/10 |

*Shahwara* (20°23′N: 81°29′E) (29.12.79)

This is a small village on the right bank of Mahanadi. At the eastern end of the village, some outcrops of granite boulders of huge sizes were observed from where a few microlithic tools were collected from the rocky surface and cultivated fields.

The tools are fresh but some pieces are slightly patinated. The predominant raw material is quartz with a few pieces of chert.

*Amlipara* (20°25′N: 81°24′E) (31.12.79)

The village lies about 2 km west of Lakhanpuri and 0.5 km south of Khairkhera village. The Mahanadi flows about 5 km to the east of the village. The site is situated on the footpath from Lakhanpuri to Garhiapara about 200 m. south of Amlidih on a rock surface covered with small trees and bushes.

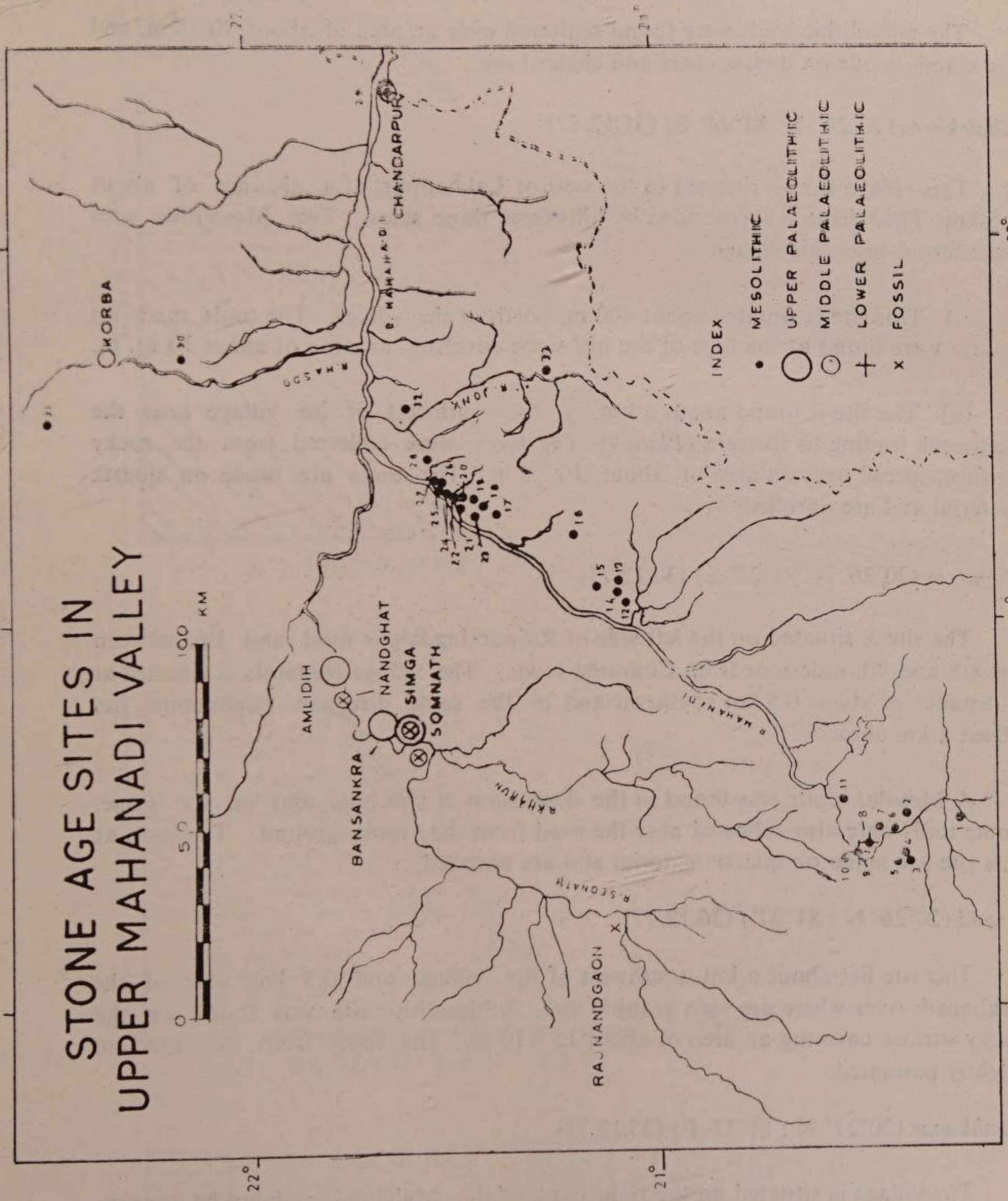



Fig. 11

(*Mesolithic sites* : 1. Kanker, 2. Shahwara, 3. Khairkhera, 4. Amlipara, 5. Jhipatola, 6. Araud, 7. Tanhkapar, 8. Haradula, 9. Bhilai, 10 Ponr, 11. Batrel, 12. Macheva, 13. Paterapali, 14. Mahasamund, 15. Kaunkera, 16. Jogi Deepa, 17. Borid, 18. Barbaspur, 19. Sukda, 20. Bhandora, 21. Putpura, 22. Pairagura, 23. Turibhatha, 24. Parsada, 25. Nandania, 26. Borsi, 27. Bagar, 28. Hataud, 29. Chandarpur, 30. Birtere, 31. Katghora, 32. Sankra, 33. Girod).

The microlithic tools were found scattered over an area of about 10×5 m. and are mainly made on quartz chert and chalcedony.

*Khairkhera* (20°24′ N: 81°24′ E) (31.12.77)

This village is also situated to the west of Lakhanpuri at a distance of about 1.5 km. The village is surrounded by hills from three sides. Two Mesolithic sites were found near this village :

(i) This site is situated about 400 m. north of the village. The tools, made on quartz were found at the foot of the hill slope covering an area of about 10 sq. m.

(ii) The site is found about a km. to the southwest of the village near the cart-track leading to Kottara (*Plate 9*). The tools were collected from the rocky surface, spread over an area of about 10×5 m. The tools are made on quartz material and are unrolled.

*Jhipatola* (20°26′ N: 81°27′ E) (30.12.77)

The site is situated on the left side of Raipur-Jagdalpur road and lies between the 8th and 9th milestone from Charama town. The village Jhipatola is situated at a distance of about 0.5 km southeast and in the same direction Lakhanpuri lies about a km ahead.

A Mesolithic site was found in the depression of two hills and on the slope. Some tools were also collected near the road from the rocky ground. The tools at this site are made on quartz material and are unrolled.

*Araud* (20°26′ N : 81°27′) (26.12.77)

This site lies about a km. southwest of the village and 0.5 km. east of the Mahanadi river where are seen granitic tors. A Mesolithic site was found on the rocky surface covering an area of about 15×10 m. The tools from this site are slightly patinated.

*Tanhkapar* (20°27′ N : 81°27′ E) (25.12.77)

The village is situated on the right bank of the Mahanadi and can be approached by an unmettled road at a distance about 20 km. northwest from Kanker. Near the village a 5 m. thick alluvial deposit rests on the right bank (Fig. 12A). The section is composed of 2.5 m thick very pale brown (10 YR, 7/4) sandy silt

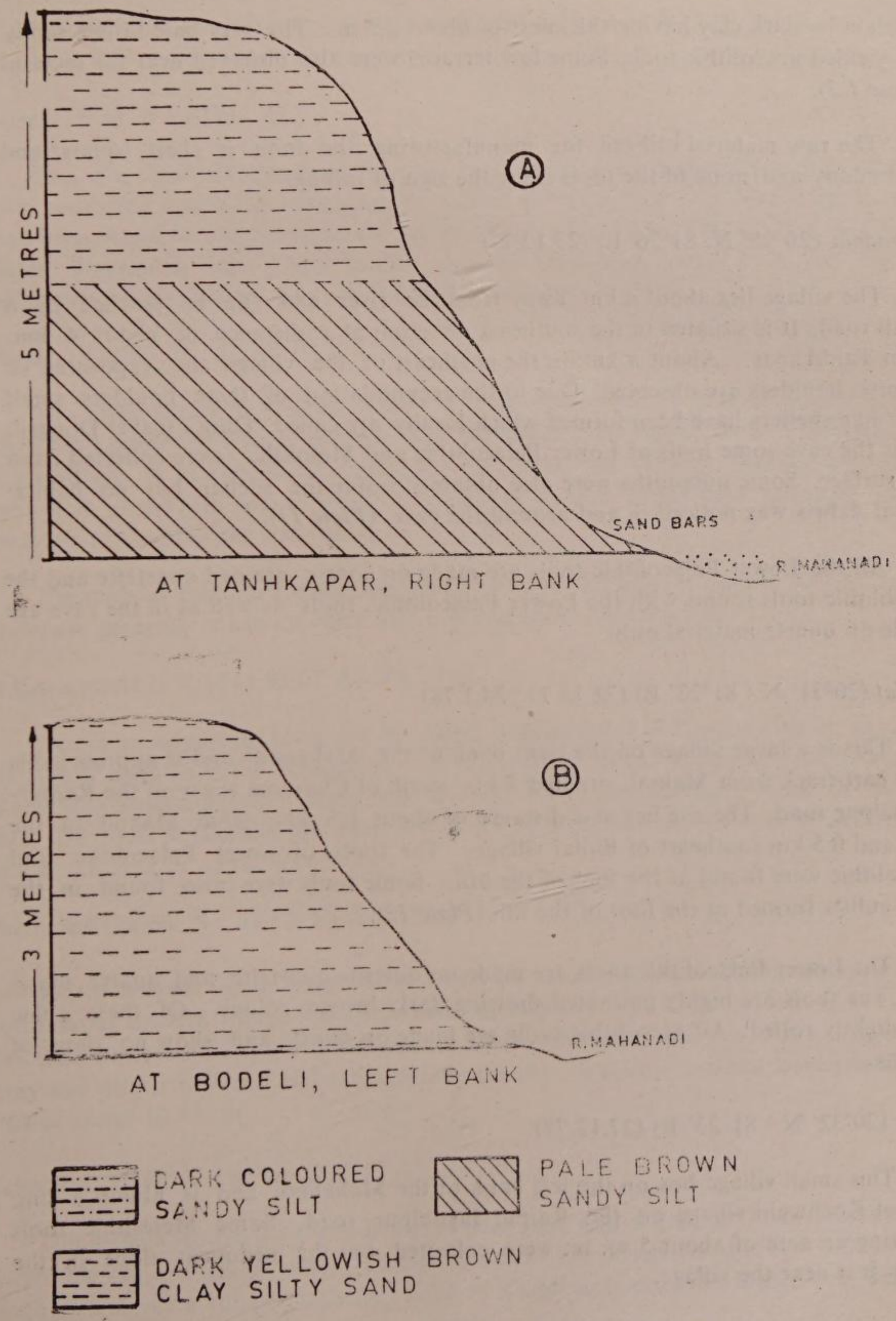



Fig. 12. Section exposed on the Mahanadi river

overlain by dark clay having thickness of about 2.5 m. The very pale brown sandy silt yielded microlithic tools. Some low terraces were also observed near the section. (*Plate 1.2*).

The raw material utilized for manufacturing the tools is chert, quartz and chalcedony and none of the tools show the sign of rolling.

*Haradula* (20°28′ N: 81°26′ E) (23.12.77)

The village lies about a km. away from the river and can be reached by a small road. It is situated in the southeast direction at a distance of about 4 km. from Tanhkapar. About a km. in the northeast of the village the exposures of granitic boulders are observed. Due to the accumulation of these boulders small cave like shelters have been formed which locally are called 'Dhora (cave) Dongri'. Near the cave some tools of Lower Palaeolithic and Mesolithic were collected from the surface. Some microliths were also obtained inside the shelter but no habitational debris was noticed in and around the cave. (*Plate 11*).

All the Lower Palaeolithic tools are made on coarse grained quartzite and the Mesolithic tools found with the Lower Palaeolithic tools as well as in the cave are made on quartz material only.

*Bhilai* (20°31′ N : 81°23′ E) (22.12.77, 24.1.78)

This is a large village on the right bank of the Mahanadi and is approachable by a cart-track from Mahud, situated 3 km. north of Charama town on the Raipur-Jagdalpur road. The site lies at a distance of about 1.5 km. from Mahud in the east and 0.5 km southeast of Bhilai village. The tools of lower Palaeolithic and Mesolithic were found at the foot of the hill. Some tools were also found in the rain gullies formed at the foot of the hill (*Plate 12*).

The Lower Palaeolithic tools are made on dolerite quartzite and quartz material. The tools are highly patinated showing dark brown colour. Of these, a few are slightly rolled. All Mesolithic tools are made on quartz and show no signs of rolling.

*Ponr* (20°32′ N : 81°23′ E) (27.12.77)

This small village lies on the left bank of the Mahanadi and is about a km. east of Kochwahi village on the Raipur-Jagdalpur road. Some Mesolithic tools covering an area of about 5 sq. m. were collected on the pediment slope in the north just near the village.

The collection at this site is small and the tools are mainly on chert and quartz.

*Batrel* (21°34′ N : 82°06′ E)

This is a small village situated on the right bank of the Mahanadi. It lies about 2 km southwest across the Inspection Bungalow of Rudri dam. The Mesolithic tools have been found on the hill slope on the left bank of a nala 200 m east of the village. The tool kit here is very small and covers an area of about 5 sq. m. The tools are made exclusively on quartz and bear reddish staining.

*Macheva* (21°06′ N : 82°06′ E) (23.1.75)

This large village is situated about 2 km. southwest of Mahasamund, the tahsil headquarter of Raipur district. The Mahanadi river flows about 7 km. west of the village. A Mesolithic site was discovered over the lateritic surface on the right bank of the Sitli nala in front of the village school. In the nala cuttings, the thickness of the laterites was found to be 2 m.

The tools at this site are sparsely scatterred over an area of about 50×30 m. These are generally made on chert material and show red staining.

*Mahasamund* (21°07′ N : 82.07′ E) (22.1.77)

This is an important town and the tahsil headquarters of Raipur district, situated 10 km away from the Mahanadi river in the east. At the extreme eastern end of the Mahasamund town a Mesolithic site was found on the right bank of Sitli nala. The tools at this site are made on chert and a few on quartz and are scattered over an area of about 40×30 m.

*Paterapali* (21°08′ N : 82°06′ E) (21.1.77)

This is a small village lying about 2 km. east of Mahasamund town and a km. northeast of Labhra village (on Mahasamund-Rajim road). On the left bank of Sitli nala a Mesolithic site was discovered. The tools are made on chert, chalcedony and quartz material and are scattered on the bouldery surface covering an area of about 10×8 m.

*Kaunkera* (21°10′ N : 82°07′ E) (24.1.77, 2.1.78)

This village is situated 6 km. south of Tumgaon and 4 km north of Mahasamund town on the Mahasamund-Tumgaon road. The Mesolithic site lies 0.5 km. north of Kaunkera village on the left bank of Kudar nala near the bridge. A dam

was under construction about 6 km. upstream from the site when it was visited on the dates mentioned above.

The site on the left bank is very rich and rests on the slope of a quartzitic surface. The tools are scattered over an area of about 50×30 m. The raw material on which the tools are made is chert of various colours, chalcedony and quartz. On the right bank only a few tools made on chert were found.

*Jogideepa* (21°14′ N : 82°15′ E) (13.1.77, 14.1.77)

This is a small forest village and is situated on the Raipur-Sambalpur road lying at a distance of about 15 km. north-west of Tumgaon. A Mesolithic site was found just near the road on the right side of the foot-path leading to Jalki which lies at a distance of about 2.5 km. from the site on the Kasdol-Tumgaon road. The Mahanadi flows about 10 km to the west of the site.

The tools were found on the rocky granitic surface at the foot of the Jalki Dongri and are scattered over a small area of about 5 sq.m. The tools are made on quartz, chert and a few on chalcedony and are in fresh condition.

*Borid* (21°24′ N : 81°16′ E) (17.1.77, 18.1.77)

This is also a forest village, surrounded by hills and forests. The village lies about 2 km. east of Chuhri village on the Kasdol-Tumgaon road and is about 12 km northwest of Sirpur, a famous archaeological and historical site. A microlithic site was located on the left bank of Sukhlai nala just near the village. The tools were collected on the rocky ground covering an area of about 200 sq. m. along the nala.

The tools are generally made on chert, chalcedony and quartz and are unrolled.

*Barbaspur* (21°26′ N : 82°17′ E) (18.1.77)

This small village lies about a km northwest of Aurai village on the Kasdol-Tumgaon road. A microlithic site was found about 0.5 km. west of Barbaspur on the left bank of the Barbaspur nala, which joins the Mahanadi after a journey of about 4 km. The tools at this site are exclusively made on chert.

*Sukda* (21°28′ N : 82°18′ E) (27.2.77)

The village is situated on the Kasdol-Tumgaon road at a distance of about 22 km southwest of Kasdol town and about 4 km east of the Mahanadi river. About

400 m east of the village, a Mesolithic site was found on the rocky surface covered with quartzitic rock fragments of various sizes (*Plate 10*).

The tools are made predominantly on chert material and a few are on quartz and chalcedony. None of the tools in the collection shows any amount of rolling.

*Bhandora* (21°29′ N : 82°19′ E) (5.2.77, 27.2.77)

This small village is situated on the right bank of the Mahanadi at a distance of about 4 km from Kasdol in the southwest direction. A Mesolithic site was found at a distance of about 0.5 km. on the hill slope northeast of the village. The tools are made on chert, chalcedony and quartz and cover an area of about 10 sq. m.

*Putpura* (21°30′ N : 82°19′ E) (5.2.77)

The village lies about 20 km. away from Kasdol town on the same road. A Mesolithic site was located on the right bank of Bhandora nala at a distance of about 0.5 km in the east from the village. The site was found on the rocky ground in an area of about 40×30 m. The tools at this site are made on chert and a few on chalcedony material.

*Paragura* (21°30′ N : 82°19′ E) (4.2.77)

The village is situated at the confluence of the Mahanadi and Balamdi rivers and is nearly 18 km. from Kasdol town. Microlithic tools were collected on both the sides of the Kasdol-Tumgaon road on the left bank of the Balamdi nadi. The tools occur on the rocky surface as well as on sub-recent alluvium. Some of the tools were also collected southwest of the village at the foot of a hill. The tools are made on chert, chalcedony and quartz.

Near the village the Mahanadi and the Balamdi were also examined. The Mahanadi is very wide and shows no alluviation along the banks whereas the Balamdi has preserved about 4 m. thick alluvia on its both banks. The beds of these rivers are covered with brown sand.

*Turibhatha* (21°31′ N : 82°20′ E) (3.7.77)

This small village lies on the right bank of the Mahanadi about 17 km from the Kasdol town. Nearly 0.5 km southeast of the village a microlithic site was found on the right bank of the Balamdi nadi. The tools were found scattered on the rocky surface covering an area of about 5 sq. m. These are made on chert material and a few among them have got dark patination.

*Parsada* (21°32′ N : 82°21′ E) (3.7.66)

This place is situated on the right bank of the Mahanadi river on the Kasdol-Tumgaon road nearly 14 km. southwest of Kasdol town. The microlithic tools were picked up near the village in the vicinity of the quartzite boulders. Some microliths were also recovered from the yellowish brown soil about 30 cm below the surface in the trenches dug by the local people.

*Nandania* (21°31′ N : 82°21′ E) (2.2.77)

This village is also situated on the Kasdol-Tumgaon road about 10 km southeast of Kasdol. At a distance of about 300 m. southwest of the village a microlithic site was found on the rocky surface just near the road. The tools occur in a small area of about 6 × 5 m and are mostly made on chert.

*Borsi* (21°33′ N : 82°22′ E) (1.2.77, 2.2.77)

This village is located 2 km north of Nandania village and about 8 km southwest of Kasdol town. Nearly about 300 m southwest of the village where the Kasdol-Mahasamund road takes a sharp turn to the north a Mesolithic open air station lying over the rocky surface was located. The tools at this site are scattered over the area measuring 5 × 4 m and they are mainly made on reddish chert and chalcedony.

*Bagar* (21°33′ N : 82°24′ E) (29.1.77, 26.1.78)

Bagar lies at a distance of about 7 km southwest of the Kasdol town on the Kasdol-Tumgaon road. The Mahanadi flows about a km west of the village near Narayanpur where an ancient temple is situated on the right bank of the river. On the low lying hill slopes a rich Mesolithic site was discovered.

*Hataud* (21°35′ N : 82°26′ E) (6.2.77, 25.1.77)

This site is located between two villages namely Goalindih and Hataud which are connected by unmettled road from Kasdol and lies southeast at a distance of about 5.5 km. The Mahanadi river flows about 6 km west of the site. The tools of Mesolithic culture were found on the rocky ground and slope of small quartzitic hill near the two 'Shiva temples' (*Plate 13*). The site is very rich and covers an area of 50 sq.m. The tools made on chert, chalcedony and quartz were found at this site.

*Chandarpur* (21°43′ N : 83°14′ E) (12.2.78)

This is an important town situated on the left bank of the Mahanadi at the junction of Raigarh and Bilaspur districts and lies at a distance of about 30 km from Raigarh on the road leading to the Sarangarh. This site yielded Lower Palaeolithic, Middle Palaeolithic and Mesolithic tools at the confluence of the Mahanadi and the Lath nala. Some tools of Middle Palaeolithic culture were also collected on the left bank of the Mahanadi near the temple.

About 0.5 km. downstream from the bridge a section of 3 m alluvial deposit is exposed on the left bank. It is composed of yellowish brown silt showing laminations at the base.

**(b) Sites on the Seonath river**

*Rajnandgaon* (21°06′ N : 81°02′ E) (22.2.78)

This is an important town of the westernmost district of Madhya Pradesh. The river Seonath flows at a distance of about 5 km southwest of this place. A molar of *Bubalus bubalis* sp. was found near the bridge in the bed of the river which is covered with brown coloured fine sand. No Pleistocene deposit and cultural material could be noticed here.

*Somnath* (21°24′ N : 81°48′ E) (21.2.78)

This place is situated at the confluence of the Seonath and Kharun rivers and lies about 8 km. upstream from Simga town. The area around the village is covered with thick alluvium. On the left bank of Seonath a 4 m thick section of yellowish brown silt is exposed. Middle Palaeolithic tools alongwith the fossils of *Bos* sp. were found from the section and river gravel.

The tools are made on chert, jasper and chalcedony. Some of the tools are very fresh and a few among them show little rolling indicating their transportation for some distance.

*Simga* (21°37′ N : 81°42′ E) (18.2.78, 27.5.79)

This is a small town on the right bank of the Seonath river at a distance of about 50 km. northeast of Raipur on the Raipur-Bilaspur road. Near this town 4 localities yielding tools of different industries were found. They are as under :

Locality 1 :

This locality lies about 0.5 km. upstream from the Simga bridge. Here a section of about 3 m yellowish brown sandy silt rests on both the banks. The shale rock is found to be exposed in the river bed as well as on the right bank for about 200 m. length.

The tools on Middle Palaeolithic industry occur on the right bank on surface and also in the loose gravel scattered in the bed of the river. These are made of chert and chalcedony and a few among these are rolled. Fossilized bones and molars of *Bos* were also found along with the Middle Palaeolithic tools at this site.

Locality 2 :

A km. downstream beautiful sections are exposed on both the banks of the Seonath river. On the left bank a section having thickness of about 7 m consists of a gravel at the base (1.5 m thick) overlain by 4 m light yellowish brown silt (7.5 YR/6/4) which is again capped by 1.5 m thick brown or dark brown (7.5 YR 4/4) silt. (Fig. 13).

Apart from the section the gravel spread covers the bed of the river and yields Middle Palaeolithic tools along with the fossils of *Bos indicus* and *Bos namadicus.*

On the right bank, just opposite the section described above, two terraces were observed. (Fig. 13). The lower terrace is formed about 3 m above the present river bed and is composed of dark brown silt whereas the higher terrace is above 5 m with light yellowish brown silt.

Locality 3 :

Near the bridge, a gravel resting over the shale was found along the right bank of the river. (Fig. 14 B). The gravel occurs at a height of about 3 m above the present river bed. It is extensively dissected by rain gullies. The tools of Upper Palaeolithic culture were found on the exposed gravel and in the gullies. Some of the tools of this culture were also found in the river bed as well as in the cultivated fields.

Locality 4 :

About 200 m southeast of this gravel and a km west of Simga town, another Upper Palaeolithic site was located at a high elevation, covered with the fragments

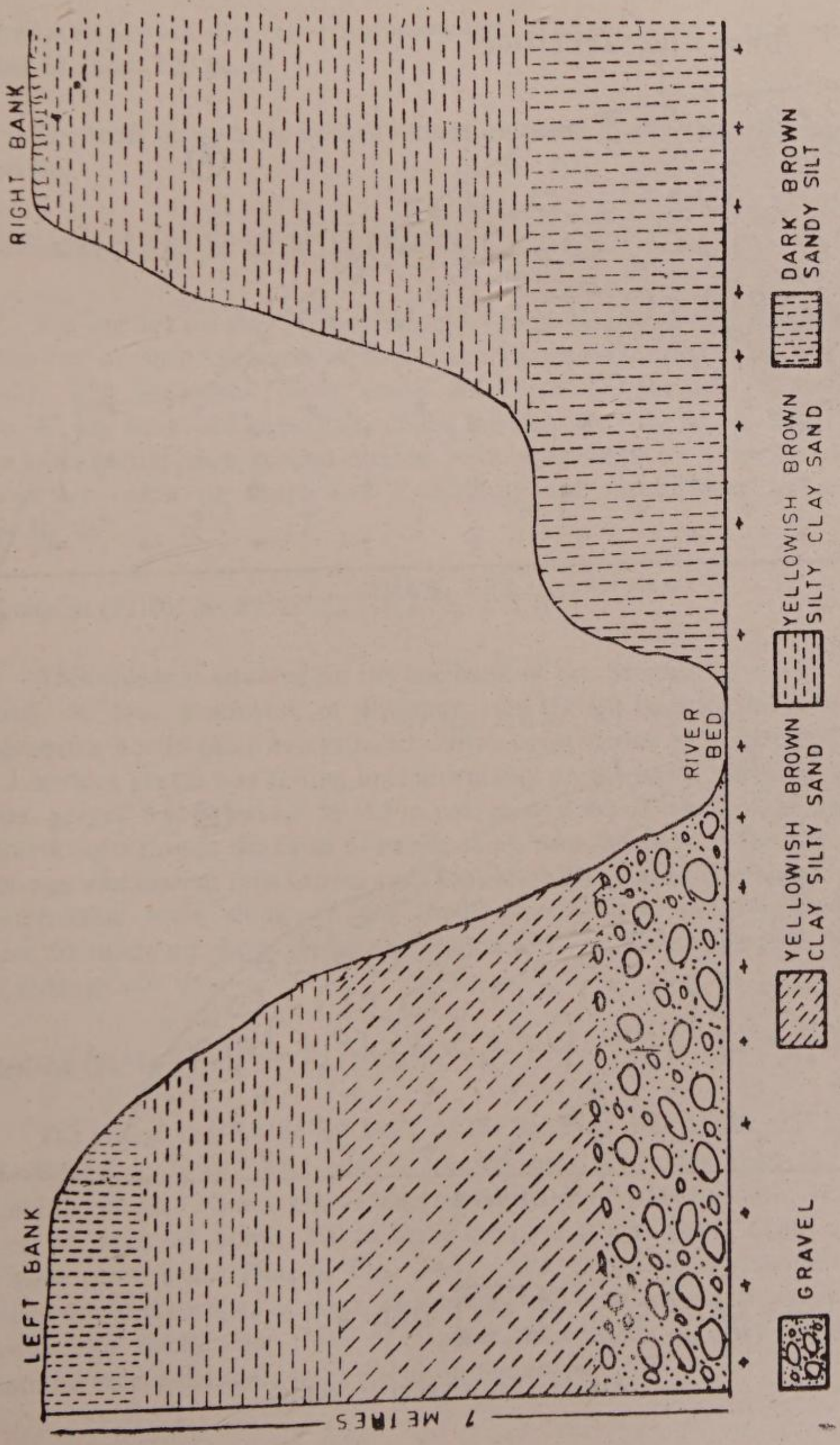



Fig. 13. Section across the river Seonath at Simga

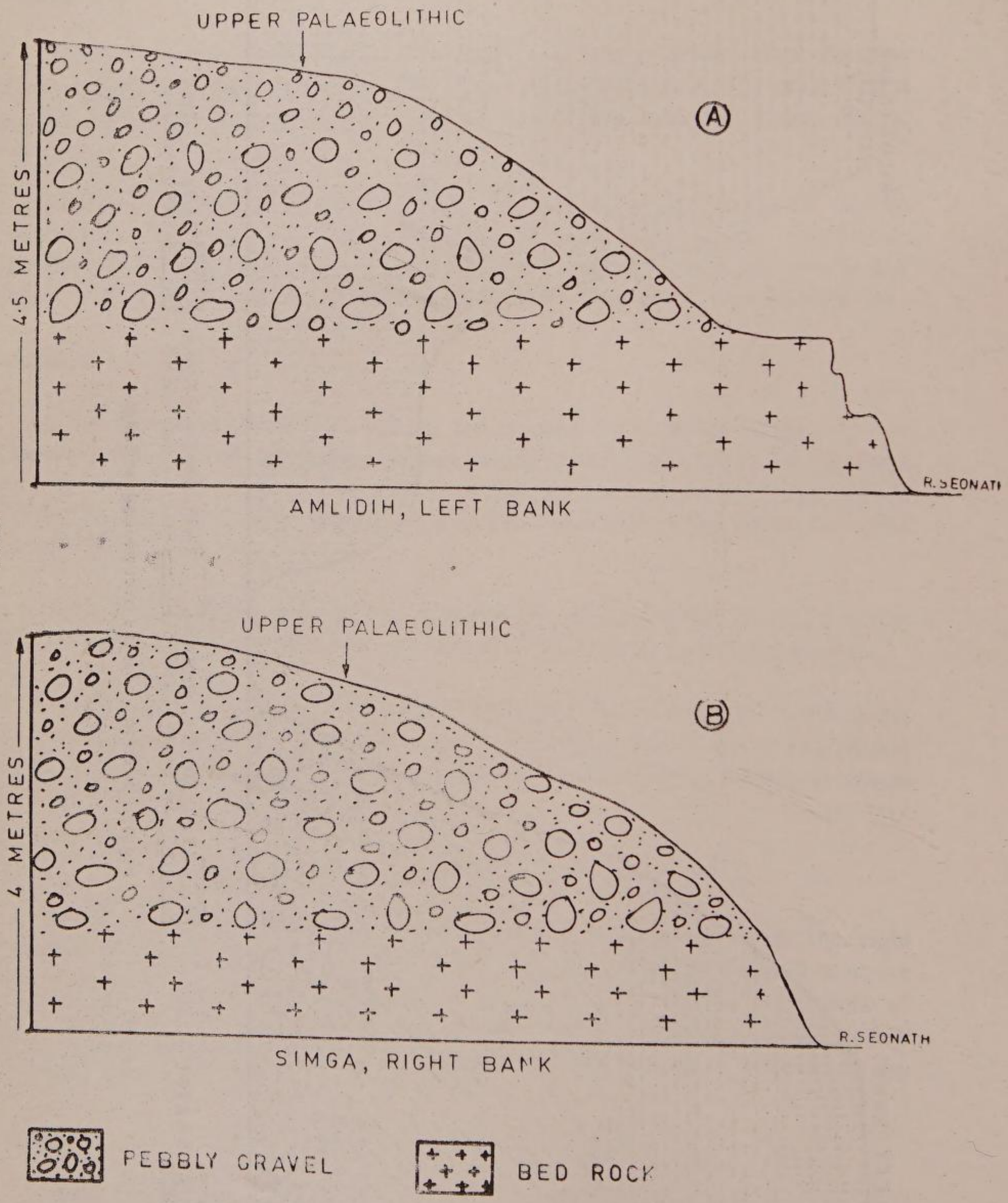



Fig. 14. Section of river Seonath

of weathered rock and yellowish brown silt. The site is very rich and covers an area of about 300 sq. m.

The tools at both the sites are made on chert, jasper and chalcedony and are unrolled.

*Bansankra* (21°36′ N: 82°36′ E) (30.5.79)

The site lies on the Raipur-Bilaspur road nearly 5 km northeast of Simga town and about a km south of Bansankra village on the left bank of the Sitawar Nala. The Mahanadi flows about 3 km north of the site. Near the mile-stone No. 49, the tools of Upper Palaeolithic industry were found on both the sides of the road on the plain ground littered with fragments of wheathered shale. The tools are made on chert and chalcedony are spread over an area of about 250 sq. m.

*Nandghat* (21°01′ N: 81°48′ E) (18.2.78, 30.5.79)

This village is situated on the left bank of the Seonath river on the Bilaspur road, 60 km. southwest of Bilaspur. On the left bank of the Seonath, a section measuring about 14 m was exposed during construction of a bridge. At the base a 3 m thick gravel was resting unconformably on the basal wheathered shale-rock. The gravel was overlain by 0.5 m coarse sand which was further capped by 10 m alluvia occurring in the form of bands of silt and fine sand. The top 0.5 m thick silt was wheathered into brown soil (Fig. 15). The gravel contained some Middle Palaeolithic tools alongwith the fossils of *Bos*. *Equus* and *Ovis/Capra*. The tools here are made on chert, jasper and chalcedony and have undergone some amount of rolling.

*Amlidih* (21°48′ N: 81°55′ E) (20.2.78)

The village lies on the left bank of the Seonath river about 25 km. southwest of Bhatapara town. The site is located near the bridge about 0.5 south of the Amlidih village. Here a gravel rests on the bank of the Seonath and is exposed over an area of about 200 m along the river at a height of about 3 m above the present river bed. (*Plate 6*, Fig. 14A). The gravel rests unconformably on the shale rock and consists of chert, chalcedony and occasionally shale pebbles and is about 3 m thick. The tools of Upper Palaeolithic industry made on the same material except the shale were found on the gravel.

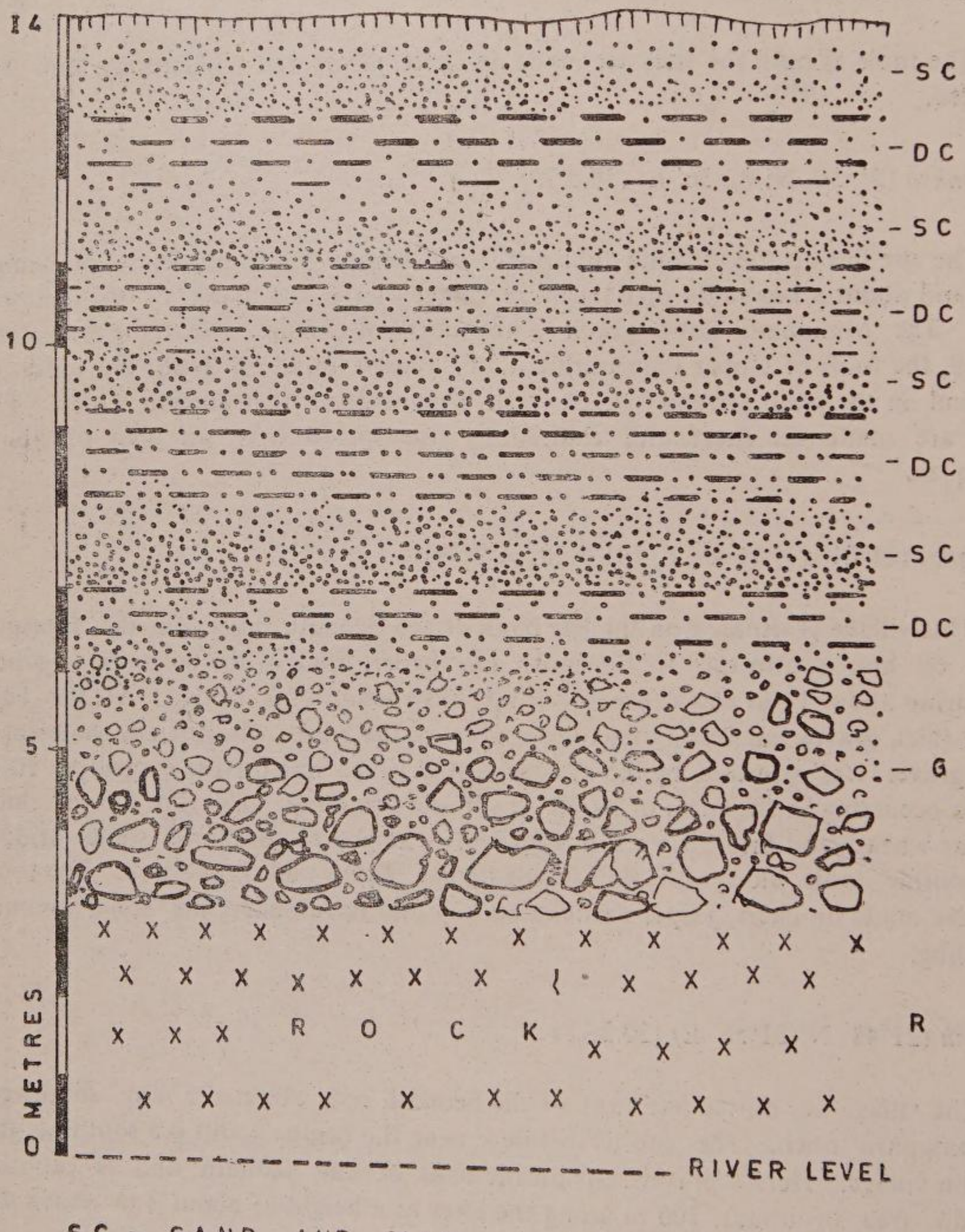



Fig. 15. Section on the right bank of Seonath river

### (c) Sites on the Hasdo river

*Katghora* (22°30′ N: 82°33′ E) (192.78)

This is a small town on the left bank of a Nala on the Korba-Bilaspur road and is situated about 30 km north-west of Korba town. About a km. northeast of Katghora the area near granitic hills yielded an industry of Mesolithic culture (*Plate 15*).

*Korba* (22°21′ N: 82°43′ E) (19.2.78)

This is an important town in the coal fields area and lies on the left bank of the Hasdo river. Some Middle Palaeolithic tools were collected on the right bank just near the dam across the river.

The tools are generally made on chert and quartzite material and a few among them have been patinated.

*Birtere* (22°09′ N: 82°41′ E) (19.2.78)

This village is situated on the Champa-Korba road about 13 km northeast of the Champa town. The site is situated about 0.5 km. north of the village. Here Mesolithic tools were found on the slope of low lying hills covered with reddish soil (*Plate 16*).

### (d) Sites on the Jonk river

*Sankra* (21°39′ N: 82°17′ E) (23.1.78)

This is a small town situated on the Raipur-Sambalpur road. About 8.5 km. north of Sankra microlithic open air stations spread over granite rock were discovered on the right bank of the Jonk river. The area of granitic surface is locally called 'Dhompakhan' (*Plate 14*). The tools made on chert, quartz and chalcedony were found at two places showing different typological character.

Near the site a section of alluvial deposit measuring about 3 m and consisting of Laminated dark clay (1 m) and yellowish brown silt was found exposed on the right bank of the Jonk river (*Plate 17*. Fig. 16B).

*Arjuni* (21°40′ N: 81°44′ E) (26.1.78)

This is a small village on the Seorinarayan-Mahasamund road about 22 km.

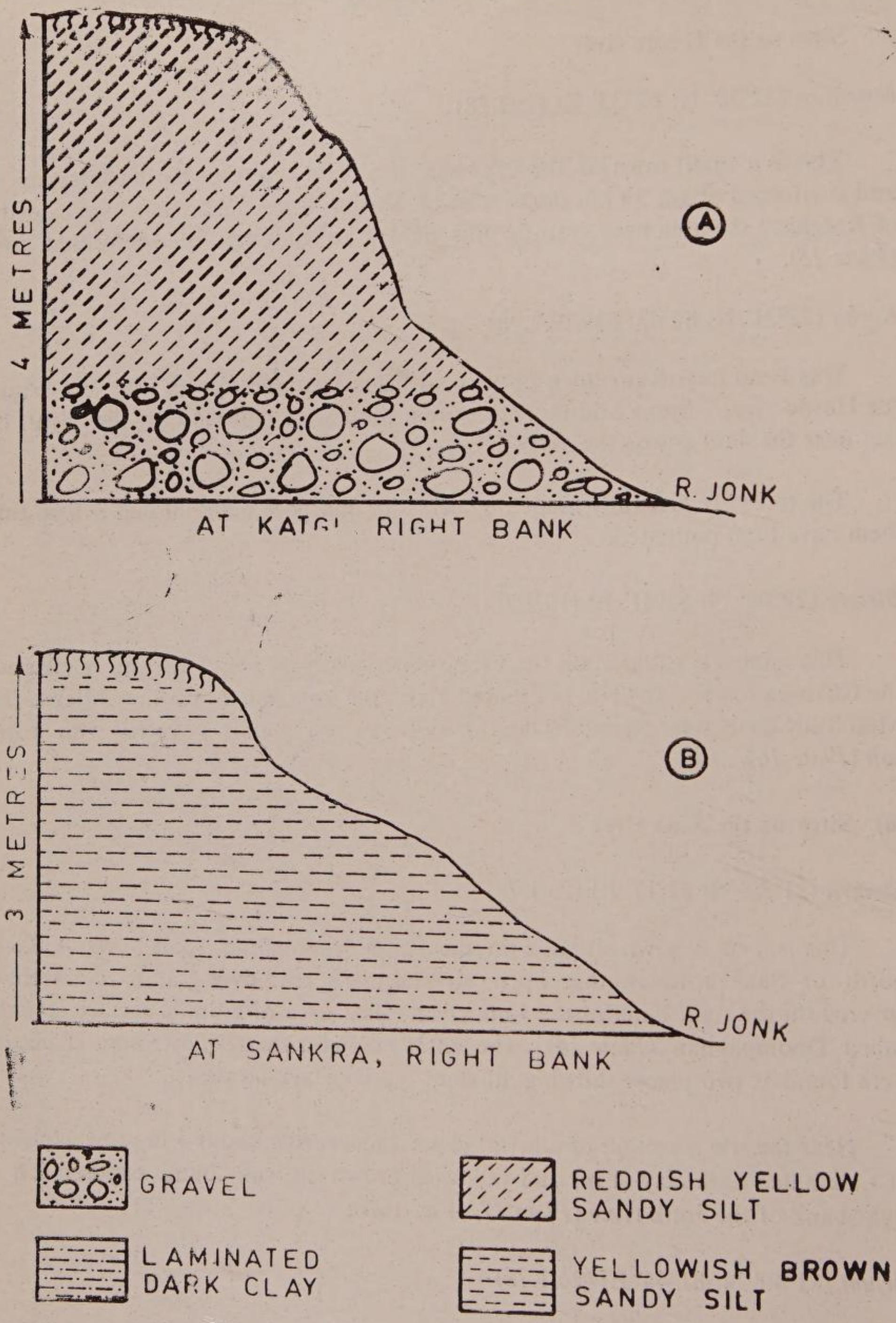



Fig. 16. Sections exposed on the Jonk river

southeast of Seorinarayan. In the cuttings for the dam an alluvial section measuring about 5 m was found exposed (*Plate 8.* Fig. 17). A gravel bed measuring about a metre in thickness was at the base and was overlain by compact reddish yellow silt about 4 m in thickness.

*Girod* (21°37′ N: 82°34′ E) (26.8.78)

The village lies at a distance of about 13 km. from Seorinarayan. The site is situated 3 km away on the right bank of the Jonk river. Tools of Mesolithic culture were found on the top of low lying hill to the south of the village which are spread over in an area of about 10 m.

*Katgi* (21°39′ N: 82°13′ E) (26.6.78)

This is a small village, situated on the left bank of the Jonk river on the Kasdol-Seorinarayan road at a distance of about 10 km northeast of Kasdol and more or less at the same distance southwest of Seorinarayan town. A gravel about a metre thick was found on the right bank sealed by 3 m thick reddish yellow silt. The gravel yielded a scraper of Middle Palaeolithic culture (*Plate. 18.* Fig. 16A).

## QUATERNARY STRATIGRAPHY

### (a) Field observations

The Quaternary deposits in the Mahanadi valley are fluvial in origin. The sections of the alluvial deposits both of Pleistocene and Holocene ages were noticed on the Mahanadi proper and its tributaries like the Seonath, the Hasdo and the Jonk. These rivers have preserved alluvium right from their source areas but thick alluviation could be noticed only on the tributaries in their central and lower parts. The alluvial deposits are 'cut and fill' type and occur in the form of the distinct terraces at about 3-4 m and 4-11 m respectively above the present river bed and have lateral extent of about 4-5 km on either bank. The alluvium is also found to occur in cup-like depressions developed in the valleys. It is composed of gravels, sands, silts and clays which could be distinguished into two groups (Krishnan, 1958). Older alluvium and younger alluvium. In general the older alluvium is coarse and compact with light yellowish brown to reddish yellow colours. The younger alluvium is finer, unkankarized, brown, dark brown or very pale brown in colour. The contact between these two alluvial deposits is generally gradual but sometimes sharp contacts have also been observed.

At several places the exposures of alluvial deposits are found resting unconformably on shale rock. The gravels occur at the base, overlain by finer materials

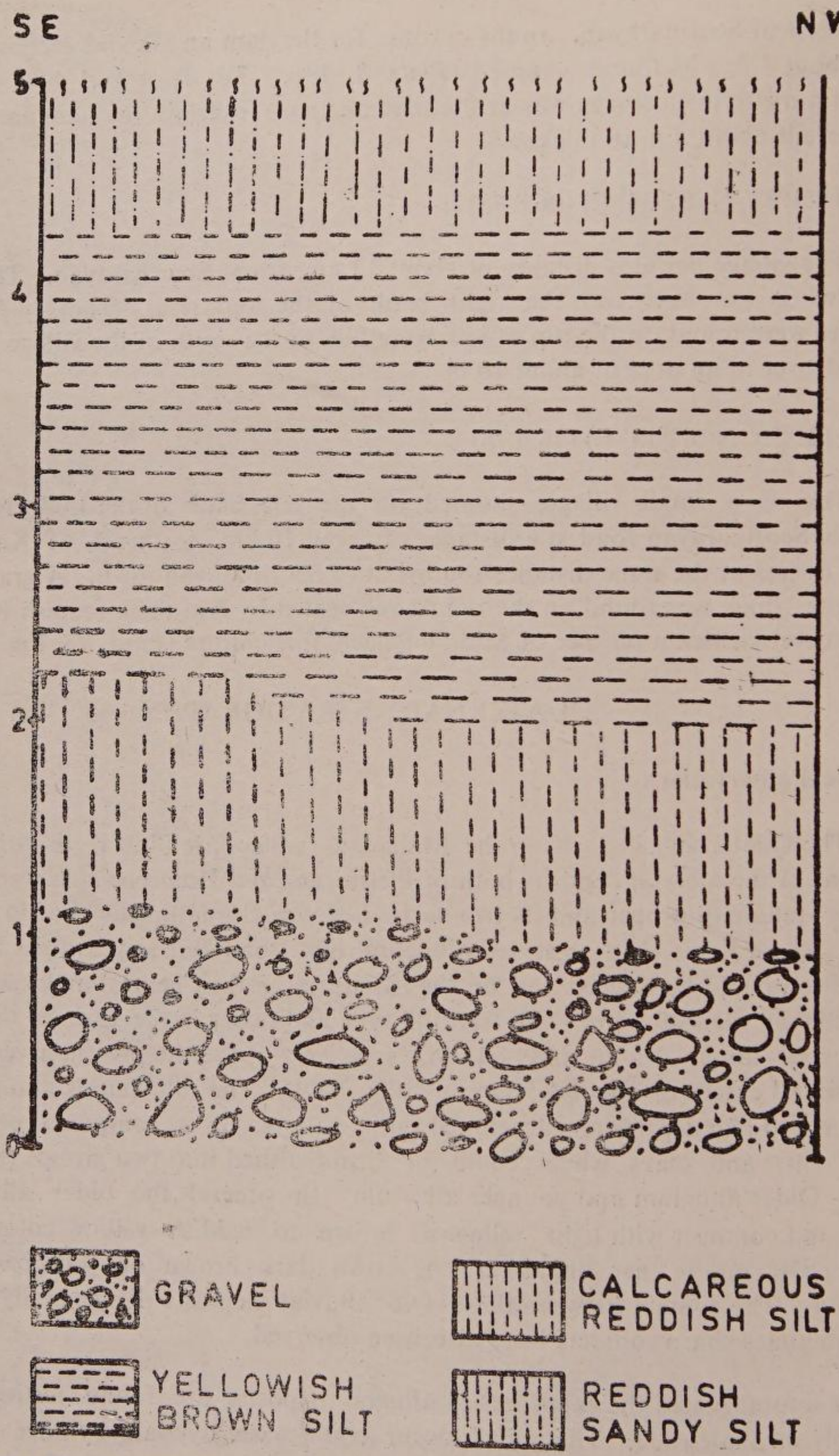



Fig. 17. An exposed section in the cuttings of Arjuni dam on the Jonk river

in the form of sands, silts and clays. These sections often preserve cultural and faunal material. The details of studies of each grade of alluvium are given below.

**Gravel I**

This formation is found mostly along the tributaries and is absent in the upper portion of the main river. It is mainly concentrated in the middle and lower reaches of the Seonath and Jonk rivers, between Seonath and Khargahni and Sankra and Seorinarayan respectively. The thickness of these gravels varies from 1 to 3 m at different places. The dominant lithocomponents are chert, jasper, chalcedony, granite, shale and quartzite. The pebbles of chert and other silica family minerals are comparatively smaller (maximum 150-200 mm). The gravels found on the Seonath show the dominance of the pebbles of silicious family minerals while the Jonk gravels are predominantly granitic material. Occasionally the quartzite, quartz and shale pebbles occur in the gravels of both the river valleys. Lateritic pellets were also found in these gravels. The gravels occurring along the Seonath river are loose and less consolidated whereas those on the Jonk are compact due to cementation.

The gravels consist of well rounded, sub-rounded and sub angular water worn pebbles indicating their transportation by fluvial processes. These pebbles are unimodal, moderately sorted and rest on the Pre-Cambrian rocks. The stratified gravel deposits are generally exposed at the base of the section more or less at the bed level as at Simga at Katgi. They have also been found in the cuttings during the construction of a bridge at Nandghat (*Plate 5*) and a dam at Arjuni (*Plate 8*). Sometimes loose gravels is coarse sand and the cementing material is generally calcareous. These gravels have yielded Middle Palaeolithic tools and late Pleistocene fossils of *Bos. Equus* and *Ovis/Capra* at Nandghat, Simga and Somnath. At all the places, the gravels were overlain by thick alluvium varying in thickness from 3 to 11 m.

**Gravel II**

This gravel was located at Simga and Amlidih on the Seonath and Panchdhar on the Mahanadi river. At Simga and Amlidih (*Plate 6*), it lies over the banks about 3 m. above the present river bed while at Panchdhar the gravel is situated about 1.5 to 2 km away from the river, occurring about 12 m above the modern course of the river. Inter-fringed by fine sand and silt, the consolidated gravels on the Seonath river directly rest on the weathered shale rock whereas at Panchdhar it overlies the thick laterites. The cementing material is again calcareous, the part

of which is leached out. Several pebbles in the gravels carry gravel encrustations. The laterite at Panchdhar on which the gravel rests is seen 2 m deep in the trenches dug out by local people. The base had not been exposed. The pebbles are scattered on the surface and sands, silts and clays were found to be almost absent probably due to their removal by extensive erosion. The pebbles of this gravel show patination and give glossy appearance. In these gravels the proportion of silica minerals is significant. The pebbles in these gravels are comparatively smaller in size than those of in the Gravel I. These gravels on the Seonath have yielded tools of Upper Palaeolithic. Due to recent erosion both the tools and pebbles were often found in the bed of the river.

**Sand**

Overlying the Gravel I a deposit of about 0.5 m thick sand was noticed at Nandghat on the Seonath river. The junction of this deposit with the underlying gravel is gradual but the contact is sharp with the overlying alluvial deposit. The source of sand is obviously the Archaeans and sedimentary rocks of the Cuddapah system over which most of the rivers in this region flow. The main constituents of this deposit are the angular to sub-angular grains having light brown to dark brown colours. No cultural and faunal material has so far been found in this deposit (*Plate* 5, Fig. 15).

**Silt and Clay**

The Mahanadi and its tributaries each provide evidences of finer grained alluvial deposits which generally overlie the gravels and sands. Exposures of silts and clays measuring at places upto 11 m thick have been noticed on all the rivers. They form two distinct terraces in the valley. The lower terrace is formed by sub recent alluvium and occurs 3-4 m above the present level of the river whereas the higher terrace is of the older alluvium lying above 4-11 m above the present river level. These terraces are however, not extensive and could be noticed only at a few places (*Plate 1*, Fig. 13). The concealed alluvial deposits were encountered upto 25 m below the surface in the drilling operation by the Irrigation Department near Seoni. The main components of the alluvium are sands, silts and clays. Of these silts and sands are more common. They are of various shades like yellowish brown, light yellowish brown, very pale brown, and reddish yellow. The sand mixed with the silt is also distributed very well in the valley. Fine sand sometimes occurs in the form of bands in the alluvium as at Nandghat, indicating frequent floods attaining higher levels. The clay has also been found with the silt (Table. 8).

The alluvium in the area is sometimes traversed by numerous small kankar nodules which are found at the base and gradually disappear at the higher levels,

TABLE 8

| S. No. | Locality | River valley | Colour | P.H. Value | Grain size in mm Clay | Silt | Fine sand | Coarse sand | Classification |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Bodeli | Mahanadi river | 10 YR 4/4 Dark yellowish brown | 6.8 | 21.250 | 42.000 | 30.150 | 6.600 | Clay silty sand |
| 2. | Tanhkapar | ,, | 10 YR 7/4 Very pale brown | 7.3 | 2.250 | 3.250 | 74.500 | 20.000 | Sandy |
| 3. | Kasdol | ,, | 7.5 YR 6/4 Light yellowish brown | 7.3 | 25.474 | 4.750 | 66.300 | 5.475 | Clayey sand |
| 4. | Simga a | Seonath river | 7.5 YR 4/4 Between brown to dark brown | 6.8 | 2.250 | 15.750 | 15.800 | 66.200 | Sand |
| 5. | Simga b | ,, | 10 YR 5/4 Yellowish brown | 8.1 | 26.250 | 42.750 | 17.580 | 13.420 | Clay silty sand |
| 6. | Simga c | ,, | 10 YR 5/4 Yellowish brown | 8.0 | 23.750 | 29.500 | 14.125 | 32.625 | Silty clay sand |
| 7. | Nandghat | ,, | 7.5 YR 6/4 Light Yellowish brown | 8.3 | 2.000 | 3.250 | 84.5000 | 10.250 | Sand |
| 8. | Katgi | Jonk river | 7.5 YR 6/6 Reddish yellowish | 7.2 | 0.500 | 1.500 | 37.850 | 60.150 | Sand |

At places, such as Arjuni, the alluvium is highly laminated and compact. The top-most sub-recent alluvium in the valley is slightly acidic (PH 6.8) as seen at Simga (Fig. 13) and Bodeli (Fig. 12B) whereas underlying deposits are alkaline (ranging from PH 7.2 to 8.3). Except the light yellowish brown and reddish yellow coloured silts, all belong to younger alluvium which are devoid of kankars. The distinction between older and younger alluvium is made mainly on the basis of the shade of the silts and the formation of kankars in it. At some places, the older alluvium is replaced by sub-recent silt as seen at Simga, Nandghat and Somnath.

**Modern Soils**

In the valley the red soils are of wider occurrence and are found on the plains as well as uplands. They are mainly developed on the shale rock which sometimes has a very red colour and looks almost like laterite. This type of soil has been noticed at several places around Bhilai, Raipur, Kasdol, Mahasamund, Dhamtari etc. the thickness of which is upto 3-4 m. The red soil is rich in iron content and poor in lime and organic matter.

The dark brown soil (different from black cotton soil) is generally found in the valleys of the rivers and low lying areas, forming the plains of the upper Mahanadi. It is sandy, laminated, kankarized and sometimes it develops cracks when it is dry. This soil is also found to be very thick measuring upto 5-6 m.

## LABORATORY STUDIES

Apart from the field observations dealt in the foregoing pages I have also tried the scientific methods in the laboratory. For this study soil samples were collected from all the rivers of the region like the Mahanadi, the Seonath and the Jonk while no sample could be collected from the Hasdo river as suitable sections were not found on this river. These samples have been collected from different places as well as a series of them from one section for finding out the real nature of the deposition.

**Methodology**

For finding out the proportion of different particles such as sand, silt and clay from the sediment samples, mechanical analysis was carried out. This method can be determined by only two ways : (1) sieving through a set of sieves and (2) pipette technique. In the present desertation the soil samples have been analysed by pipette technique only (Piper, 1956 : 59-74).

The cumulative curve of percentage by weight (gm) against grain size (mm) is plotted on semi-log paper (Fig. 18, 19). The study of the size distribution characteristics of sediments has been made with the help of sediment size parameters. The result of the mechanical analysis is presented in the Table 8.

Other parameters such as medium value (Md), sorting index (SO) were found out on the basis of the methods prescribed by Pettijohn (1969). In the classification of the sediments, the methods of Folk (1974) are followed. Soil colour was determined according to the Munshell colour chart.

While determining the pH value 20 gms of soil sample was taken in a beaker and 50 ml of distilled water was added. The solution was shaken for 5 minutes on an electric shaker. By using buffer solution of 4.0, 7.0 and 9.2 pH, the pH meter (Philips portable pH meter model No. 9040) was standardized. These pH solutions are prepared by using BDH standard buffer tables of 4, 7 and 9 pH respectively. Readings on the pH meter for the soil solutions were subsequently recorded.

Determination of organic carbon was done by colourimetric method. One gram of soil sample was passed through 72 mesh sieve and was taken into a 100 ml volumetric flask. The 10 ml of $K_2$ Cr 207 solution (1 normal) and 20 ml of concentrated $H_2SO_4$ were added in the flask and shaken properly to get complete reaction. After half an hour distilled water was added to make the volume 100 ml. It was then kept overnight for the soil particles to settle to the bottom, a blank solution without soil was also prepared in a similar fashion. Green chromium sulphate colour of the clear supernatant liquid is read on colorometer by using No. 60 (600/4) red filter. The colorometer was first adjusted to zero having taken the blank liquid and then the reading of the liquid soil sample was recorded.

The reading was plotted against a standard curve for organic carbon (A standard curve for organic carbon of anhydrous sucrose, and analytical reagent, in the range of 1 to 25 was already prepared by the same procedure. Colorometric readings were plotted against carbon values calculated from the weights of sucrose multiplying by 0.42 and the organic carbon was found out by the calculations given below :

$$\text{Organic carbon } \% = \frac{\text{Graph readings} \times 0.42 \times 100}{1000}$$

Fractions of the fine sand passed through 72 mess (BSS) were treated with stanous chloride ($SnCl_2$) and 1N. hydrochloric (HCl) acid were boiled for half an hour for removing the ferruginous and humus/organic matter coatings on the

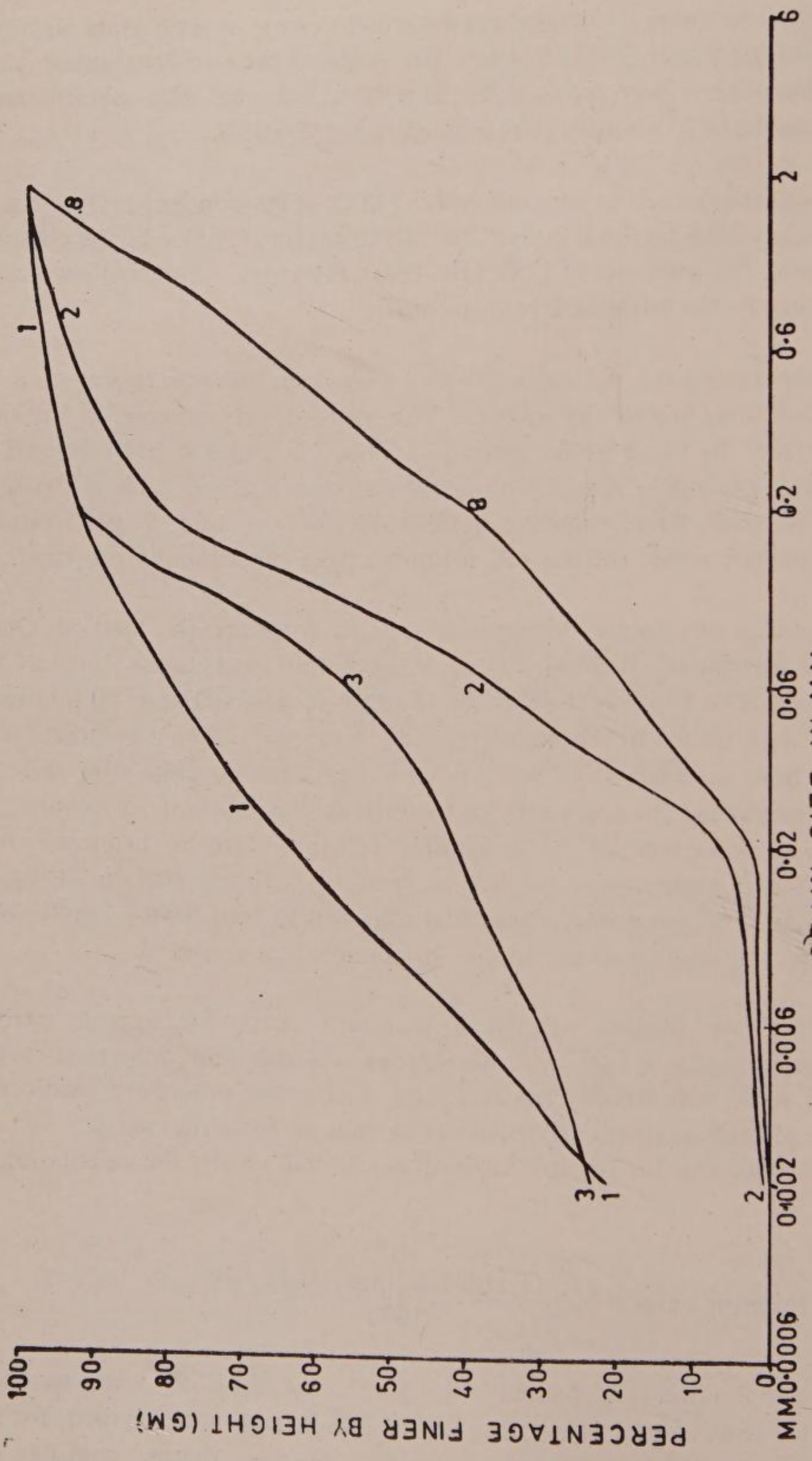



Fig. 18. Particle size distribution of soil samples

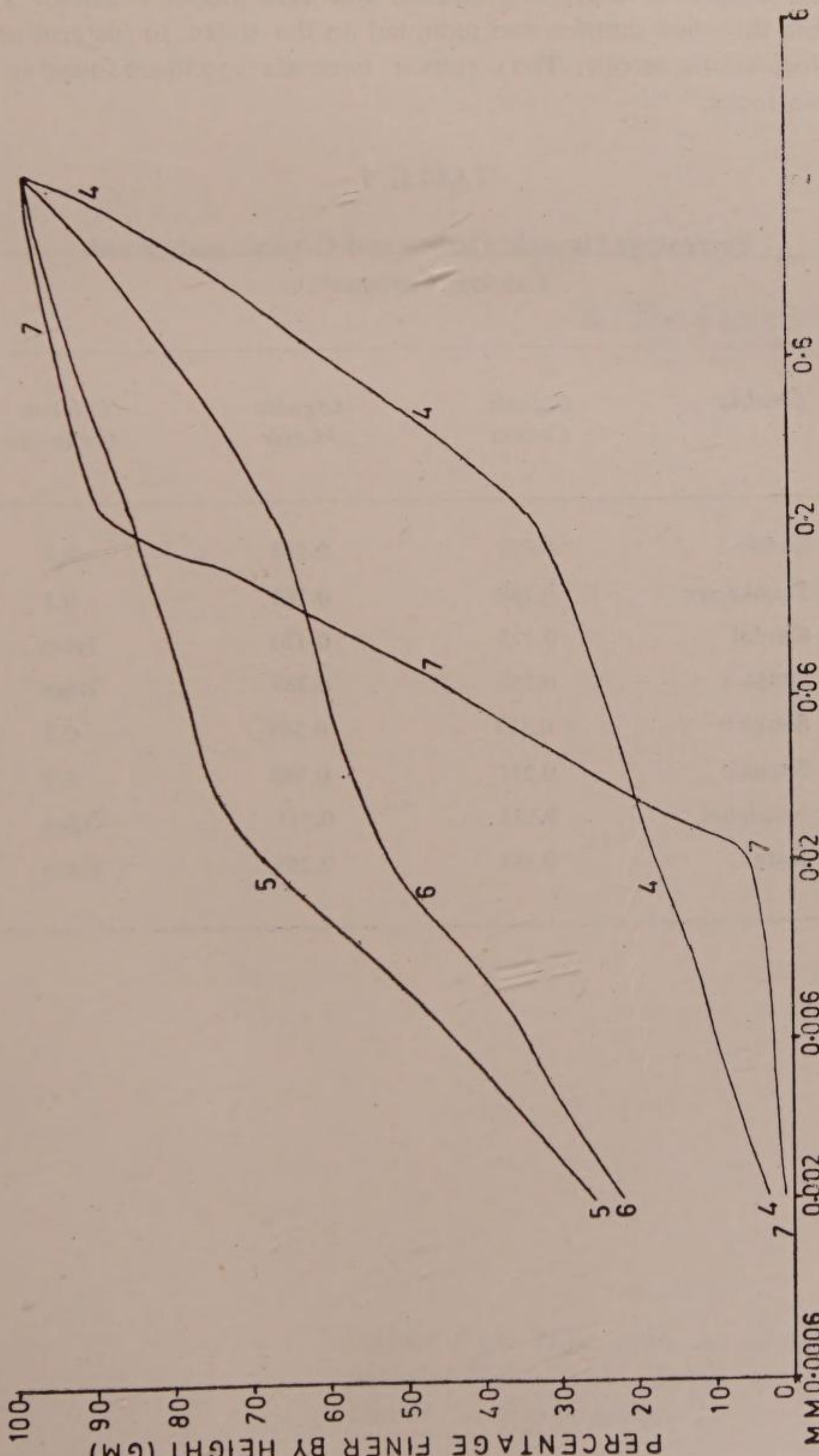



Fig. 19. Particle size distribution of sand samples

minerals. The samples were properly cleaned and were properly dried. Then very fine sand from the dried samples was mounted on the slides to determine minerals under petrological microscope. The common minerals are those found in archaean and Vindhyan rocks.

TABLE 9

**Percentage Organic Carbon and Organic matter and Calcium Carbonate**

| *Locality* | *Organic Carbon* | *Organic Matter* | *Calcium Carbonate* |
|---|---|---|---|
| Bodeli | 0.282 | 0.486 | 0.2 |
| Tanhkapur | 0.168 | 0.289 | 0.1 |
| Kasdol | 0.273 | 0.470 | Trace |
| Simga a | 0.168 | 0.289 | Trace |
| Simga b | 0.319 | 0.549 | 0.2 |
| Simga c | 0.231 | 0.398 | 0.2 |
| Nandghat | 0.182 | 0.313 | Trace |
| Katgi | 0.168 | 0.289 | Trace |

# B. The Faunal Material

*"Apart from their value as stratigraphic and palaeoecological tools, fossils are also important in the economic sense".*

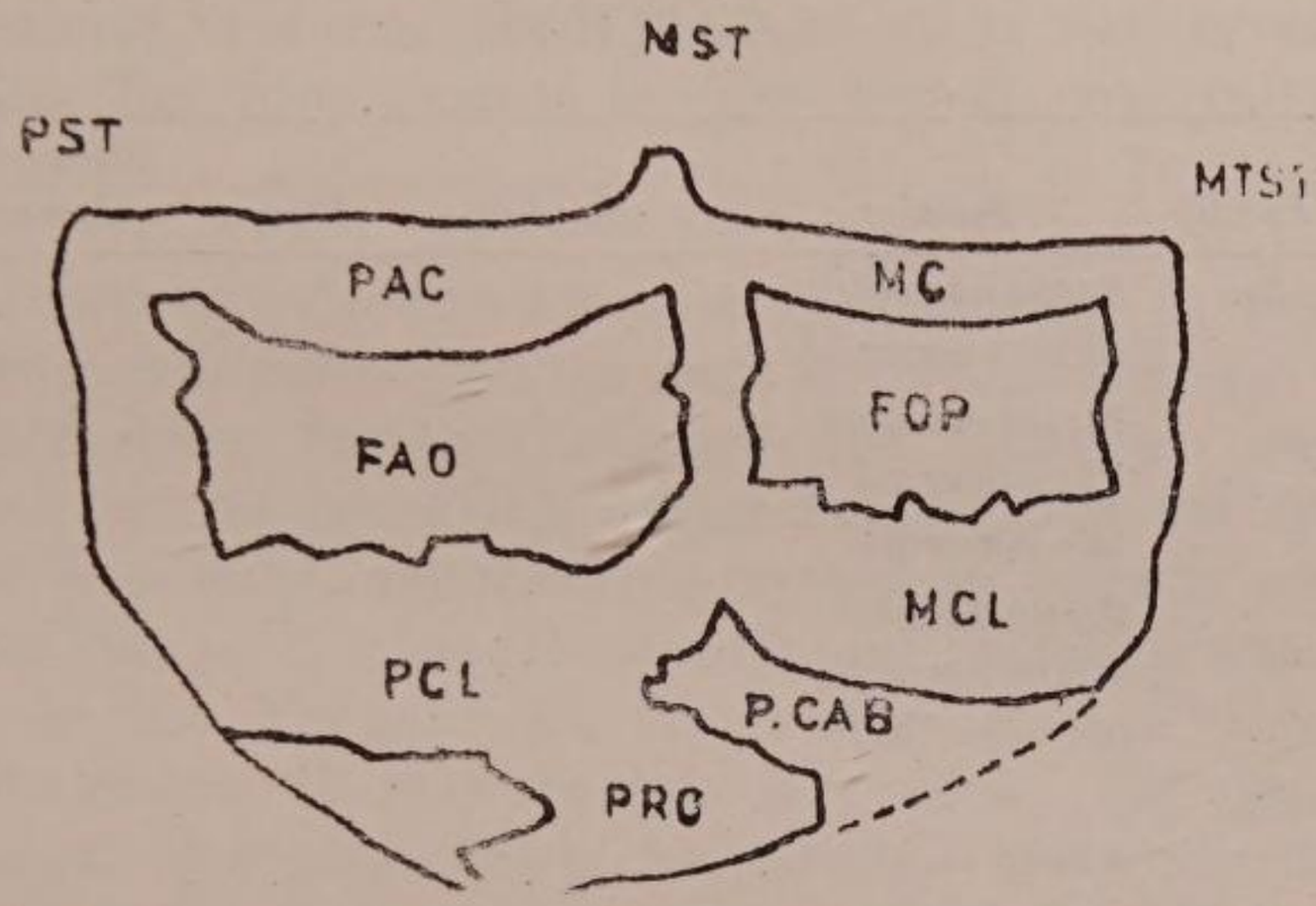
R. Mirely 1980 : 116

Palaeontological studies of the Quaternary period are of great importance. The significance of these studies increases when the fossils are found in association with archaeological material in the stratigraphical context. Although the fossil evidences were recorded from the Siwaliks (Falconer and Cautley 1936, 1849) and Narmada (Princep, 1832 : 456-458) in thirties of the last century, these were effectively correlated with the archaeological remains in the stratigraphical context perhaps for the first time by the team of De Terra and Paterson (1939) in different parts of India. This team not only recorded the discoveries but also tried to build up a comprehensive history of the palaeo-environment. After this classic work several river valleys of Peninsular India were explored from a similar point of view and many of them have yielded the palaeontological remains along with archaeological material in the stratified deposits (Badam 1979 : 165-218). The fossils found during the explorations of the upper Mahanadi by the writer provide further information not only on the ancient fauna but to some extent also on the palaeo-environment.

Having understood the value of Palaeontology in determining the chronology of Palaeolithic cultures I have tried to grasp the methodology of presenting the palaeontological data with the help of Dr. G.L. Badam, palaeontologist in the Department of Archaeology at the Deccan College Research Institute, Pune.

The Mahanadi flows between two great rivers namely the Narmada and Godavari and is one of the largest rivers of Peninsular India. The fossils in the Mahanadi are found from four localities : Nandghat, Simga, Somnath and Rajnandgaon. At these localities they are found in the pebble conglomerate (Gravel I) alongwith the Middle Palaeolithic tools. The species represented in the valley are as follows :

| *Species* | *Localities* | | | |
|---|---|---|---|---|
| | Nandghat | Simga | Somnath | Rajnandgaon |
| | 20°01′ E | 21°37′ N | 21°34′ N | 21°06′ N |
| | 81°48′ N | 81°42′ E | 81°48′ E | 81°02′ E |
| Equus namadicus | + | — | — | — |
| Equus caballus | + | — | — | — |
| Equus asinus | + | — | — | — |
| Bos sp. | + | — | — | — |
| Bos namadicus | + | + | — | — |
| Bos indicus | + | + | + | — |
| Bubalus bubalis | + | — | — | + |
| Ovis/Capra | + | — | — | — |




(Pst) : Parastyle, (Mst) : Mesostyle, (Mtst) : Metastyle,
(Pac) : Paracone, (Mc) : Metacone, (Fao) : Prefossette,
(Pcl) : Paraconule, (Mcl) : Metaconule, (Prc) : Protocone,
(P. can) : Plicaballin. (Fop) : Post fossette

Fig. : Generalised sketch of an upper left premolar/molar of *Equus* sp.

A suitable set of terms for the dental morphology of the equids has been selected for usage in the present work after consulting the contributions of Stehlin and Graziosi (1935) and Simpson (1951).

This is the first time that vertebrate fossils have been discovered in the upper Mahanadi valley. The area lies close to the Narmada valley and no ecological barrier seems to have existed between the two. The Narmada is regarded as a classic area in the Peninsular India for Quaternary, archaeological and palaeontological studies. Several animal fossils have been found from the Narmada alluvium which normally should also be found in the Mahanadi valley.

The fossils of the Mahanadi were compared with those from other areas, such as Narmada, Godavari, Manjra and Ghod. They belong to the late pleistocene and their association with Middle Palaeolithic tools more or less confirms this aforesaid date.

Most of the faunal material in the Mahanadi area is in the form of isolated lower and upper teeth, vertebrae, astragalae, calcanea, limb fragments and numerous unidentifiable parts. Some of the fossils are fragmentary and beyond reconstruction and identification. Here only teeth are described in detail as other findings are fragmentary. The fossil elements found in the valley are listed below :

TABLE 10

| *Cite No.* | *Family* | *Species* | *Sites* | | | |
|---|---|---|---|---|---|---|
| | | | *Nandghai* | *Simga* | *Somnath* | *Rajnandgaon* |
| NDG-8 | Equdae | *Equus namadicus* (Right upper M1) | + | — | — | — |
| NDG-9 | | *Equus caballus* left upper p2 | + | — | — | — |
| NDG-1 | | left upper p4 | + | — | — | — |
| NDG-2 | | Equus asinus Right lower p4 | + | — | — | — |
| NDG-3 | | left upper M1 | + | — | — | — |
| | Bovidae | | | | | |
| | | *Bos sp* | | | | |
| | | Right upper M3 | + | — | — | — |
| | | (part of theoraioe vertebrae) | + | — | — | — |
| | | *Bos namadicus* | | | | |
| NDG-6 | | (Right upper M2) | + | — | — | — |
| | | (Left upper M2) | — | + | — | — |
| | | (astragalus) | + | | | |
| | | *Bos indicus* | | | | |
| NDG-4 | | (Right Lower M1/2) | + | — | — | — |
| SMG-3 | | (Right Lower M2) | — | + | — | — |
| SMG-10 | | (Right lower P3) | — | + | — | — |
| SMG-9 | | (Left Lower molar) | — | + | — | — |
| SMG-2 | | (Left lower M1/2) | — | + | — | — |
| SMG-1 | | (Left upper M1) | — | — | + | — |
| SMG-5 | | (Right upper M2) | — | + | — | — |
| NDJ-7 | | (Right upper M3) | + | — | — | — |
| | | *Bubalus bubalis* | | | | |
| RDN-2/ NDG-12 | | Left lower M3 | + | — | — | — |
| NDG-12 | | Left lower M1 | + | — | — | — |
| | | *Ovis/Capra* | | | | |
| NDG-14 | | Right lower M3 | + | — | — | — |

**Systematic Palaeontology**

Class : Mammalia Linn
Order : Perissodactvea Owen, 1947
Family : Equidae Cray, 1821
Sub family ; Equinae stainmann and Doderlein, 1890
Genus : *Equus Linn*, 1958

*Equus caballus* : (NDG-1) (Plate 21. 1 and 22.1)

This is the left upper fourth premolar of *Equus caballus*. The body of the crown is well preserved. The remnants of the roots can be seen in the form of a shallow depression. The crown seems to be quite high so that the tooth can be classed hypsodont.

The occlusal surface of the crown is somewhat squarish in outline and the body of the crown is little curved. All the cusps are well preserved. The ectoloph is divided into three styles : Parastyle, Mesostyle and Metastyle. Out of the three ridges : on the ectoloph the metastyle is weaker than parastyle and mesostyle. The distance between the parastyle and mesostyle (known as anterior enterstyler face) is greater than the distance between the mesostyle and metastyle which is known as posterior enterstyler face. The enterstyler face is more concave than its posterior counterpart. The enamal of both the styles is rounded. The anterior tip of the mesostyle is twinned. The cusps below the parostyle and mesostyle respectively known as paracone and metacone are well preserved and deep. The prefossette and post-fossette are fully developed and the enamel of sides in both the cases is much crenulated. However, the crenulation in posterior part of the side enamel of the professette is more pronounced. From the manner of crenulations, it seems that the tooth has not suffered much wear. The plicaballine fold projects much inward towards the centre of the tooth and its lip is twinned. The anterior enamel of its top almost touches the enamel of the posterior side of the prefossette. Protocone is saucer shaped and compressed with its lingual side almost straight. The hypocone is well preserved. Mataconule and paraconule are depressed.

*Equus caballus* (NDG-9) (*Plate* 21.2 and 22.2)

The tooth is left upper second premolar of *Equus caballus* having somewhat triangular crown pattern. The crown of the tooth is sloping. The body of the crown is straight and well preserved with undamaged roots. Among the three ridges of the ectoloph parastyle is less prominent. The anterior tip of the mesostyle is twinned. The distance between parastyle and mesostyle is greater than that between mesostyle and metastyle. The anterior interstyler face is more concave than the posterior. The tooth has an accessary fold on its left side. Paracone as well as metacone are well developed. The prefossette and post-fossette are well marked and the enamels in both the cases are not much crenulated except on the sides. The plicabaline fold is twinned but does not go much inward. Paraconule and metaconule are slightly depressed. The sides of the protocone are rounded.

*Equus namadicus* (NDG-B) (21.3 and 24.3)

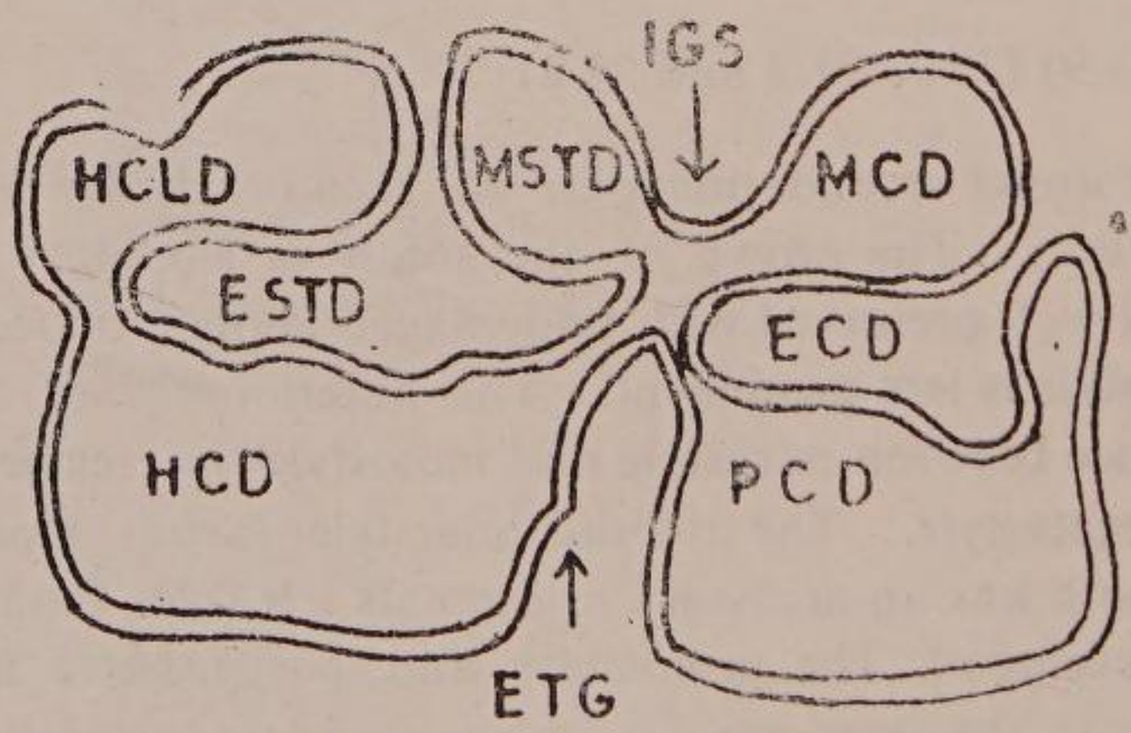
This is upper right first molar of *Equus namadicus*. The two ridges on the ectoloph : parastyle and mesostyle are well developed and rise abruptly from the

ectoloph. The mesostyle is higher than the parastyle. Metastyle is weakly developed. The enterior enterstyler face is more concave than the posterior one. Paracone and metacone are well developed. Metacone is deeper. Prefossette is of rectangular shape with two reentrants : one on the anterior side and other on the posterior side. The posterior fossette has developed a saucer shaped structure on its anterior upper end and the enamal of the saucer is somewhat plicate. Its lower end touches the inner upper end of the enamel of the prefossette. The protocone is well developed with flat lingual surface and its cross section is of lunar appearance. Plicaballine fold is well developed without any twinning at the anterior end. The enamel of the hypocone has weathered to a great extent. Metaconule is present in the form of depression. No comments on the paraconule can be offered because the tooth has broken at that spot.

The crown of the tooth is long and the roots are broken. *Equus asinus* (NDG-3) (*Plate 21.4* and *22.4*)

The left upper first molar of *Equus asinus* has roughly squarish crown pattern. All the cusps are well preserved and the enamel of the crown is broken below the prefossette due to which part of parastyle is also absent. The roots of the tooth are not damaged much.

The surface of crown near the ectoloph is higher and slopes down towards protocone. Anterior enterstyler face is concave and distance between mesostyle




(HCLD) : Hypoconulid
(MCD) : Metaconid
(ECD) : Entoconid
(HCD) : Hypoconid
(ETG) : External Grove
(MSTD) : Metastylid
(ESTD) : Ectostylid
(IGS) : Lingual Sinus
(PCD) : Protoconid

Fig. : Sketch of a right lower premolar of *Equus asinus*.

TABLE 11

**Measurement in mm of the dentition of Equus sp.**

| *No.* | *Species* | *Length* | *Breadth* | *Thickness* | *Prefossette* | *Postfossette* | *Protocone* | *Metaconlid* | *Metastylid* |
|---|---|---|---|---|---|---|---|---|---|
| NDG. 1 (LUP 4) | Equus caballus | 26 | 25 | 55 | 11×5.5 | 10×6.5 | 11×5.5 | | |
| NDG. 9 (LUP 2) | Equus cabalus | 34 | 21 | 55 | 14×5 | 10.5×6 | 8×6 | | |
| NDG. 8 (RUM1) | Equus Namadicus | 22 | 23 | 35 | 11×5 | 9×5 | 9.5×5 | | |
| NDG. 3 (LUM 1) | Equus asinus | 20 | 21 | 34 | 9×4.5 | 8×5 | 10×5 | | |
| NDG. 2 (RLP 4) | Equus asinus | 23 | 14 | 65 | — | — | — | 6×4 | 5×4 |

and parastyle is more than that between mesostyle and metastyle. The mesostyle is more prominent than the metastyle and parastyle and rises abruptly from the ectoloph. The paracone and metacone are deep and well preserved. The prefossette and postfossette are well marked and their enamel is not crenulated. The protocone is compressed entroposterally with the lingual side almost straight. The plicaballine fold does not go much inward and is not twinned.

*Equus asinus* (NDG-2) (*Plate. 21.5* and *22.5*)

The specimen is well preserved right lower fourth premolar, the only lower tooth in the present collection. The crown is rectangular in occlusal pattern and the tooth is high crowned and moderately worn. The structure of the crown is simple and without any additional cusps inside or corners. The metaconid and metastylid are irregularly rounded. The former is bigger than the latter. These two cusps are separated by a deep lingual sinus. The cusps are almost flat on the buccal side. External grove is quite deep and goes far inward to the middle of the tooth. The hypoconlid is well preserved and has a rounded enamel. Hypoconid and protoconid are broad and well preserved. Their enamel shows no crenulation and is of uniform width throughout.

**Remarks**

In the present work these species are represented for the first time in the upper Mahanadi valley though represented by the scanty material. Distribution of the various horses from the different parts are tabulated below: (Table 12) (after Badam 1979 : 165-218).

A number of species of Equidae have been described from India. The most common among these being *Equus sivalensis* of Northwest India. The most important discovery of horses is from Narmada the species being *Equus namadicus*. Another species of horses *Equus palaeonus* described from Narmada valley but later on it was considered the synonym of *Equus namadicus*.

*Equus namadicus* was described by Faulconer and Cautley (1849) from the upper Pleistocene of Narmada valley. Mathew (1929 : 437-560) Colbert 1935: 1-401), and Hooijer (1949 : 243-267) thought the Narmada and Siwalik species are the same and Narmada species may be progressive form of the Siwalik horse. Except for the slight differences in the skull (skull of the *Equus namadicus* is larger and broader) there are not morphological differences in the asteological parts. After the statistical study of the Pleistocene Equidae Badam (1979: 165-218) supports the fact that the *Equus namadicus* may be a survival from the Siwaliks having migrated to the Central India plains after a considerable lapse of time.

TABLE 12

| Age | Culture | Locality | Species | Remarks |
|---|---|---|---|---|
| *Late* | *Upper Palaeolithic* | *Kurnool (A.P.)* | *Equus asinus*<br>*Equus. sp.* | *Equus sp. has resemblance with those of Ghod valley* |
| Pleistocene | | Meshvo (Gujarat) | Equus of asinus | |
| | | Ghod valley near Inamgaon (Maharashtra) | Equus sp. | |
| | | Nevasa (Maharashtra) | Equus sp. | Equus palaeonus is synonym of Equus namadicus |
| | Middle Palaeolithic (M.S.A.) | Mula Valley near Khupti (Maharashtra) | Equus sp. | |
| | | Susunia (U.B.) | Equus namadicus | |
| | | Narmada (M.P.) | Equus namadicus<br>Equus palaeonus | |
| Middle | Lower Palaeolithic (E.S.A.) | Narmada (M.P.) | Equus Namadicus, | Equus sp. was found opposite Hathiwell section on river Pravara near Nevasa along with lower Palaeolithic and Middle Palaeolithic tools. |
| | | Godavari (Maharashtra) | Equus palaeonus<br>Equus namadicus | |
| | | Nevase (Maharashtra) | Equus sp. | |
| | | Ariyalur (Tamil Nadu) | Equus namadicus | Ariyalur is a Middle Pleistocene site. No stone tools have been found here. |
| Early | No tools | Karewas (Kashmir) | E. sivalensis<br>Equus sp. | No stone tools. |
| | | Siwaliks (Punjab) | E. sivalensis<br>E. cautleyi | E. cautleyi is considered synonymus with E. sivalensis. |

As can be seen from the morphological study, the teeth of *Equus namadicus* are characterised by their large size and sharp crenulations in the enamel borders of the fossettes. Generally parastyle is broad and metastyle is strong. Metastyle is prominent and grooved. Protocone is short. The anterior enterstyler face is deeper than the posterior enterstyler face. The crown has a greater height. The features of the crown and teeth in general are specially designed for the adoptation to the grazing habits of the horses. Since their teeth are subjected to the severe wear.

**Systematic Palaeontology***

| | |
|---|---|
| Family | Bovidae Gray |
| Sub family | Bovinae Gill |
| Genus | *Bos* linn |
| Species | *B. namadicus* |

*Bos namadicus* (SMG. 8) (*Plate 23.1* and *24.1*)

The specimen is a well preserved, large, hypsodont, left second upper molar. Its crown is unworn and enamel is of medium thickness. On the ectoloph, the outer and median ribs are generally strong, the median ribs being somewhat more prominent than the outer ribs. The lingual side of the tooth is roguse. The basal pillar is present in the inner median valley. The prefossette and postfossette are well preserved. The enamel of fossettes increases in height from the lingual to the buccal side with the result that the buccal cusps are placed higher than the lingual cusps. The enamel of the fossettes is mildly crenulated. The crown of the tooth is elevated along the median ribs. The central parts of the crown is in the form of a depression. There are deep valleys between outer and median ribs of the ectoloph. The crown pattern is prismatic.

*Bos namadicus* (NDG. 6) (*Plate 23.2* and *24.2*)

The tooth is a right upper second molar. The enamel of the crown has a number of cracks and is also broken at a few places due to which some of its characters are not discernible. The valleys between the various ribs are shallower than in SMG. 8. Paracone and metacone are well developed and rounded in

*It should be mentioned that the *Bos* is the most common fossil in India in association with the Stone Age cultures as well as in proto-historic periods. It would therefore be interesting to make a brief review of the evidences of *Bos* from different sites of India. These have been presented in Table No. 14. A similar chart for the purpose was prepared by Badam (Table No. 12) to highlight the different types of Equus found at different sites in India.

shape which have considerably been covered with cement. The prefossette and postfossette appear to have been rectangular in shape. The enamel of the fossettes is highly damaged due to which it is very difficult to make any comments on them. The basal pillar is prominent upto 3/4 of the height from the base. Its enamel is however broken towards the top.

*Bos indicus*: (NDG. 10) (*Plate 27.5* and *28.1*)

The specimen is right upper third molar, the body of which is slightly curved. The enamel of the crown is thin, unworn and deeply folded. The height of the enamel of the fossettes increases towards anterior interstyler face with the result the position of paracone and prefossette is higher than their posterior counterpart. All the ribs at the ectoloph are strong. The paracone and metacone are well developed and rounded in shape but smaller in size. The prefossette and postfossette are deeper than in the preceding teeth. Basal pillar is weakly developed. The overall character of the tooth and its dimensions plus the unerrupted basal pillar at the top indicate that this belongs to a young individual.

*Bos indicus* (NDG. 4) (*Plate 25.2* and *26.2*)

The tooth is the right lower first or second molar having been partly damaged. At the ectoloph, all the ribs, the outer as well as the median are broken off due to which valleys between the ribs are not seen. Consequently paracone and metacone are also partly absent. The enamel of the prefossette and postfossette which is not crenulated, is well preserved and deeply folded with the folds filled with cement. The basal pillar of the crown is developed upto more than 3/4 of the height of the crown. The roots of the crown are broken at the base.

*Bos indicus* (SMG. 7) (*Plate 25.1* and *26.1*)

The tooth is well preserved right upper second molar. At the ectoloph outer as well as median ribs are strong between which deep valleys have been formed. Paracone and metacone are well developed but smaller in size. Prefossette and postfossette are not fully developed. The basal pillar is fairly developed. The crown increases in height from lingual towards buccal side. The crown of the tooth is slightly curved.

*Bos indicus* (NDG. 7) (*Plate 27.5* and *28.5*)

This specimen is also a right upper third molar. Half of the anterior part of the specimen is broken and hence most of the characters of this part are absent,

At the ectoloph outer and median ribs are prominent whereas others are absent due to damage. The cones and fossettes are not developed. Basal pillar is not prominent either. The roots of specimen are also damaged.

*Bos indicus* (SMG-5) (*Plate 27.2* and *28.2*)

The specimen is right upper second molar. The crown has several cracks and is slightly curved. At the ectoloph, median ribs are quite strong whereas outer ones on both the sides are broken off. The height of the crown rises gradually from lingual towards buccal side. Paracone and metacone are fairly developed and have rounded shape. Other cusps of the crown are broken. Prefossette and post-fossette which seem to be rectangular in outline are deep and filled with cement. Basal pillar between the folds is strongly developed. The roots of the tooth are completely damaged.

*Bos indicus* (SMT. 1) (*Plate 27.3* and *28.4*)

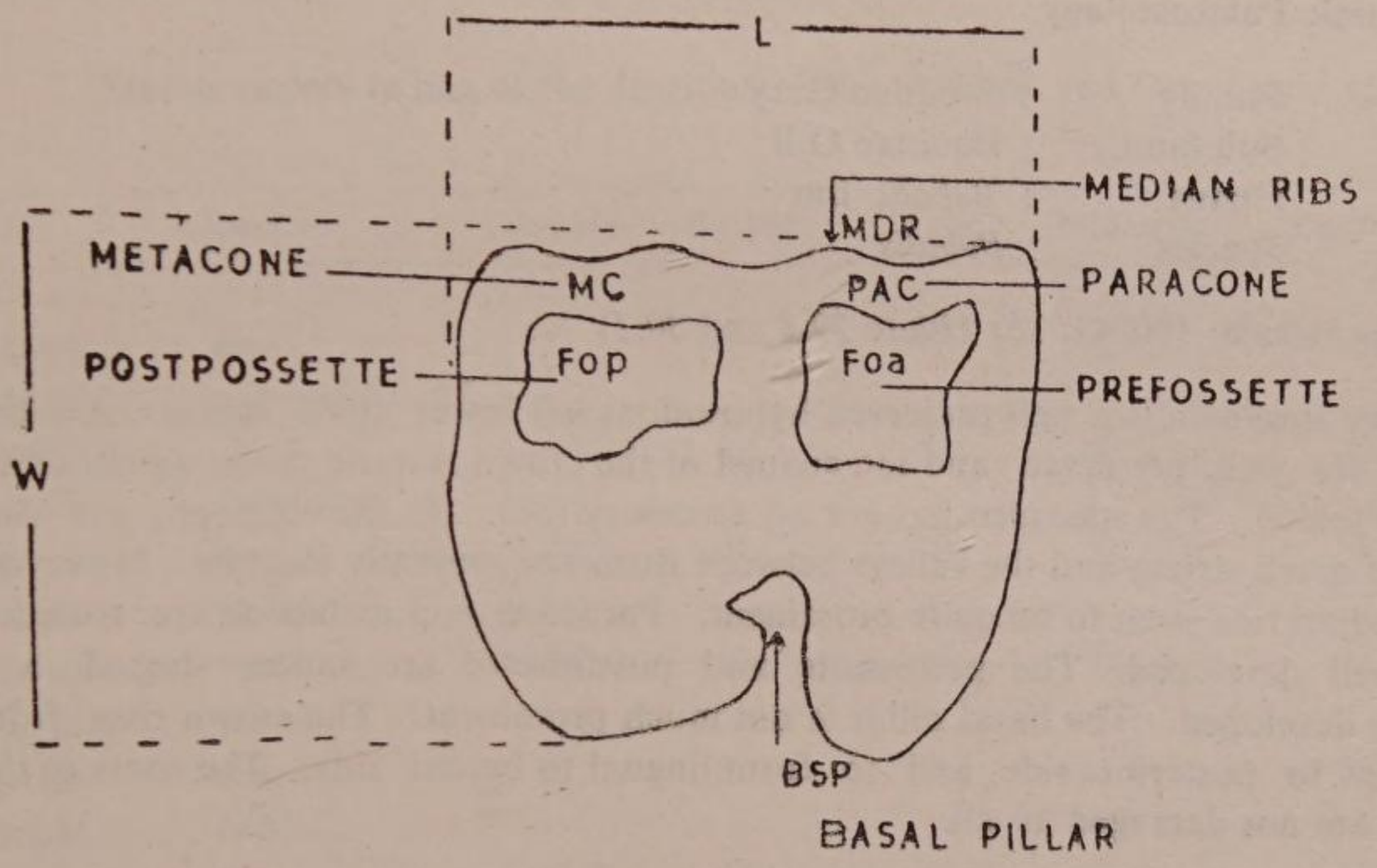
This is left upper first molar. The crown is partly damaged and its enamel is of medium thickness. This tooth has also got cracks at several places. At the ectoloph median ribs are prominent whereas outer ribs are damaged. Paracone and metacone are rounded and deep. Prefossette is damaged whereas postfossette is not fully developed. Basal pillar is also broken towards top. The roots of the tooth are fairly present.

*Bos indicus* (SMG. 9) (*Plate 25.1* and *26.1*)

The tooth is well preserved left lower molar and is roguse. The occlusal pattern of the crown is well developed and characterised by thin and less crenulated enamels. The ribs at the ectoloph are not very strong and saucer shaped. However the prefossette is less developed than postfossette. The basal pillar is weak. The roots of the specimen are completely damaged.

*Bos sp.* (NDG-5) (*Plate 27.1* and *28.3*)

This is hypsodont right upper third molar. Due to subarial drying some cracks have been developed all around the tooth. The tooth is somewhat worn. All the cusps have got a thick coating of cement. The outer and median ribs at the ectoloph are weakly developed. The valleys between the ribs are therefore shallow. Paracone and metacone are big and rounded in shape. The enamel of the fossettes is well developed but not crenulated. The enamel of the fossettes increases from lingual to buccal side. The basal pillar is quite prominent. The root remnants are hardly seen due to thick cement coating at the base.




Sketch of a left upper premolar of *Bos sp.*

*Bos indicus* (SM ⁷. 3) (*Plate 25.4* and *26.3*)

The tooth is small well preserved right lower second molar. The enamel is thick and unworn. At the ectoloph only two prominent median ribs are seen forming a deep valley between them. Outer ribs are not developed. The buccal cusps of the crown are higher than those of lingual cusps. Paracone and metacone are fully developed and deep. The fossettes are not properly developed and are saucer shaped. Small basal pillar is present in the inner median valley, the enamel of which is also thick. The roots of the tooth are undamaged and almost as long as the crown.

*Bos indicus* (SMG. 10) (*Plate 25.5* and *26.6*)

This right lower third premolar with convex buccal side and almost flat lingual side. There is deep grove along the crown length. The enamel of the tooth is quite thick. The anterior part is almost pointed and posterior side is almost flat. Root is as long as the crown. The enamel of the crown curves inward but it has not totally cut off near the tip to form a fossette. This indicates that the tooth has suffered a lesser degree of wear.

**Systematic Palaeontology**

Family : Bonidae Gray
Sub family : Boninae Gill
Genus : *Bubalus* lim
Species : *Bubalis*

*Bubalus bubalis*: (NDG. 15) (*Plate 29.3* and *30.1*)

The specimen is a well preserved hyposodont left lower third molar. All the cusps are well preserved and the enamel of the crown is quite thick, unworn and deeply folded. The specimen has got an accessory fold. At the ectoloph, the ribs are not much strong and the valleys between them are generally shallow. However, the median ribs seem to be quite prominent. Paracone and metacone are rounded and well developed. The prefossette and postfossette are saucer shaped and weakly developed. The basal pillar is not much prominent. The crown rises from anterior to posterior side and so from lingual to buccal side. The roots of the crown are not damaged at all.

*Bubalus bubalis* (RDN-2) (*Plate 28.1* and *29.2*)

This is well preserved left third molar. The enamel is not much crenulated and is quite thick. The height of the crown increases gradually from anterior to posterior side. The median ribs at the ectoloph are prominent and have a deep valley between them. Paracone and metacone are not much developed. The enamel of the fossettes is narrow and saucer shaped. The basal pillar is not fully developed and also does not reach the acclusal surface of the crown. The roots are completely absent.

*Bubalus bubalis* (NDG. 12) (*Plate 28.2* and *29.3*)

The tooth is left lower first molar. It has a squarish crown pattern and the roots are almost as long as the crown. The surface of the enamel of the crown gradually rises from lingual to buccal side so that inside view of the crown has a smooth slope. The fossettes are saucer shaped and not fully developed as also the basal pillar. The median ribs are prominent with a deep valley between them. The outer ribs are not developed at all. Paracone and metacone are wide and deep. Enamel is of medium thickness and there are no crenulations in the fossettes.

**Systematic Palaeontology**

Family : Bovidae Gray
Sub family : Bovinae Gill
Genus : *Ovis/Capra*

TABLE 13

**Measurements in mm of the dentition of Bos Bubalus and Ovis/Capra sp.**

| *No.* | *Species* | *Length* | *Breadth* | *Height* | *Prefossette* | *Postfossette* |
|---|---|---|---|---|---|---|
| SMG-8 LUM 2 | Bos namadicus | 33 | 23 | 49 | 11×5 | 10×5 |
| NDG-6 RUM 2 | Bos nama licus | 34.5 | 20 | 51 | 2 | 12 5.5 |
| NDG-10 RUM 3 | Bos indicus | 23.5 | 17 | 48 | 11×5.5 | 9×4 |
| NDG-4 RLM ½ | Bos indicus | 30 | 12 | 69 | 12.4.5 | 10.5×4 |
| SMG-7 RUM 2 | Bos indicus | 28 | 16 | 57 | 12.6 | 10.5×5 |
| NDG-7 RUM 3 | Bos indicus | 21.5 | 17 | 41 | 2 | 12×8.5 |
| SMG-5 RUM 2 | Bos indicus | 29 | 19 | 52 | 10×5 | 10×6 |
| SMT-1 LUM 1 | Bos indicus | 24 | 17 | 65 | 1 | 8×6 |
| SMG-9 LLM | Bos indicus | 29 | 12.5 | 62 | 10 5×2.5 | 12×3.5 |
| SMG-3 RLM 2 | Bos indicus | 26 | 15.5 | 45 | 9×2 | 8×2 |
| SMG-10 RLP 3 | Bos indicus | 18 | 11 | 39.5 | ? | ? |
| NDG-5 RUM 3 | Bos p. | 32 | 21 | 58 | 12.5×7 | 10×6 |
| REG-5 LLM 3 | Bubalus bubalis | 35 | 13 | 6.3.5 | 10×4 | 9.3 |
| RDN-2 LLM 3 | Bubalus bubalis | 35 | 12 | 61 | 11×4 | 11×5 |
| NDG-12 LLM 1 | Bubalus bubalis | 18 | 16 | 30 | 9×3 | 9×3 |
| NDG-14 RLM 3 | Ovis/Capra | 20 | 7 | 39 | 6×2 | 6×3 |

TABLE 14

**Distribution of Bos and Bubalus sp. in Indian Quaternary deposits**

| *Age* | *Culture* | *Locality* | *Species* | | *Remarks* |
|---|---|---|---|---|---|
| | | | *Bos* | *Bubalus* | |
| Holocene | Mesolithic | Adamgarh (M.P.) | Bos indicus | Bubalus bubalis | All the fossils except Bos namadicus are domesticated. *Bos namadicus* has also been reported from excavations at Langhnaj (Clutton-Brock, 1965) and Mohenjodaro (Sewell and Guha, 1931). |
| | | Bagor (Rajasthan) | Bos indicus | Bubalus bubalis | |
| | | Tilwara (Rajasthan) | Bos indicus | — | |
| | | Langhnaj (Gujarat) | Bos indicus<br>Bos namadicus | Bubalus bubalis | |
| Late | Upper Palaeolithic | Kurnool caves (A.P.) | Bos/Bubalus sp. | | |
| Quaternary Pleistocene | Middle Palaeolithic | Primar valley (Bihar) | Bos sp. | Bubalus sp. | The age of the sites is based faunal and cultural findings. However at Ariyalur only fauna has been taken into consideration for assigning the age of site. Since no tools have been recovered from Ariyalur |
| | | Belan Valley (U.P.) | Bos sp. | Bubalus sp. | |
| | | Narmada (M.P.) | Bos namadicus | Bubalus bubalis | |
| | | Godavari (Maharashtra) | Bos sp. | — | |
| | | Pravara (Maharashtra) | Bos sp.<br>Bos namadicus | — | |
| | | Mula Valley (Maharashtra) | Bos namadicus | Bubalbs bubalis | |
| | | Purna (Maharashtra) | Bos namadicus | — | |
| | | Ghod Valley (Maharashtra) | Bos sp.<br>Bos namadicus | | |
| | | Manjra (A.P. and Maharashtra) | Bos namadicus | Bubalus bubalis | |
| | | Krishna (Karnataka) | Bos sp.<br>Bos namadicus | — | |
| | | Ariyalur (Tamil Nadu) | Bos sp. | Bubalus Moruvattoorensis | (No tools) |
| Middle | Lower Palaeolithic | Narmada (M.P.) | Bos namadicus | Bubalus palaeindicus | |
| | | Godavari (Maharashtra) | Bos. sp. | — | |
| | | Pravara (Maharashtra) | Bos sp.<br>Bos namadicus | — | |
| | | Krishna (Karnataka) | Bos namadicus | — | |
| Early | | Karewas (Kashmir) | Bos sp. | Bubalus platyceros | (No tools) |
| | | Siwaliks (Punjab) | Bos acutifrons | Bubalus palaeindicus | |

*Ovis/Capra* (NDG. 14) (*Plate 30* and *31*)

This is a lower right third molar. The tooth is hypsodont and the crown pattern is selenodont. On the crown there are two complete cusps and an additional third cusp. The fossettes are saucer shaped. There is a deep gravel between the two main cusps on the lingual side. On the ectoloph, the outer ribs are less prominent than the median ribs and the deep grove between the two median ribs.

**Remarks**

*Bos* is the most prolific species found in the Indian Pleistocene deposits. In the Siwaliks, *Bos acutifrons* is reported from the early Pleistocene sediments. In the palaeolithic cultures, there are reports of *Bos namadicus* from many sites (see chart). However, in the Mesolithic, we have mostly *Bos indicus* found from archaeological sites. But at Langhnaj and Mohenjodaro (Chalcolithic site) *Bos namadicus* has been reported by Clutton Brock (1965 : 1-41) and Sewell and Guha (1931 : 649-763) respectively which indicates the large geological range of the species right from Lower Palaeolithic to Mesolithic cultures. At various sites such as Kalegaon, Nevasa (Sankalia 1952 : 1-59), this species has been found in association with Middle Palaeolithic tools. This species is characterised by a broad forehead and sideward pointing of horns and a hump. (Badam 1973 : 21-40). This is reported to have given rise to the living cattle of India *Bos indicus* (Badam, 1979). In fact in Mohenjodaro we have reports of both humped and humpless cattle. The humped cattle belong to the breed of *Bos namadicus* of India and humpless cattle is European *Bos taurus*. In *Bos indicus* there is a cleft in dorsal spine of the theoracic vertebrae which gives rise to the hump and also a fusion of the third trochlea of humerus. At many other sites, it has not been possible to identify the *Bos* specifically because of the fragmentry nature of the bones.

*Bubalus* is also found at many sites being represented by lesser bone material than the *Bos*. In many cases because of the isolated nature of the teeth, it cannot be distinguished from *Bos*. However, whenever the complete vertical ramus has been found, we can definitely assign the material to the species. In the early Pleistocene two species of *Bubalus* have been found namely *Bubalus palaeindicus* and *Bubalus platyceros*. The former is supposed to have given rise to *Bubalus bubalis* which is the foundation of the domesticated form from various sites. Some scholars however believe that it may be treated only as a semi-domesticated form because of its frequent inbreeding with *Bos gourus* (Zeuner 1958). A new species of *Bubalus* has been recently discovered from Maruvattoo in Tamil Nadu which has been named as *Bubalus maruvattorensis* (Ghose *et al* 1972: 79-102), on the basis of some characters. This species is much larger form than the fossil *Bubalus palaeindicus* (Narmada and

Godavari valleys) and the present day *Bubalus bubalis*. It is however smaller *Bubalus platyceros* (upper Siwaliks) which is known to be much larger than the other known buffalos. This species is also much shorter than *Bos accutifrons* (middle and upper Siwaliks) and slightly less than those of *Bos namadicus* (Narmada and Deccan river valleys).

As regards sheep and goat it is very difficult to precisely identify them in the absence of the skull. The relation of the sagittal sutures to the coronal sutures is very important in identifying the two species. In the present collection however, we have got only an isolated tooth, hence we have put it as *Ovis/Capra*.

The distribution of bovides upto the Mesolithic is given in the following chart.

**Discussion**

Although the faunal material discovered in the Mahanadi is very small, still some deductions can be made about the palaeo-environment prevailing at the time of Middle Palaeolithic cultures. The cattle (*Bos*, *Bubalus* and *Ovis/Capra*) and horse (*Equus*) generally indicate open type of landscape with grassy vegetation of the savannah type.

Presently in the Mahanadi proper the vegetation is very sparse. This is partly due to rocky exposures carrying little soil and extensive interference by the modern man due to over grazing and cultivation. As stated in the Chapter 1B, the present day climate is sub-humid with an average rainfall 1300 mm per annum. The red soils are the dominant soil types of the area. One comes across bushes and thorny vegetation in the form of pockets around the rocky outcrops in the alluvial plain of the Mahanadi.

The fossils are useful in determining the approximate age of the associated cultures but their collection in the present case is very small. Taking into consideration the similar fossils evidence from Madhya Pradesh and Maharashtra the fossils found in the Mahanadi indicate an upper Pleistocene age. They are also well dated by a scores of $C^{14}$ dates in Western India. The recent investigations in the central Godavari have revealed the antiquity of Middle Palaeolithic cultures in the range of 40,000 years B.P. Since no radiometric determination is yet possible for the upper Mahanadi valley, the absolute date of the cultures as well as the associated fossils cannot be precisely determined.

**II Molluscan shells**

The Mollusca, particularly the fresh water molluscan shells, is rather an unsuitable faunal material for fixing the chronological age, of the deposits and the

associated cultures. A very little work has been carried out in India on the Quaternary mollusca particularly in relation to their importance in prehistoric archaeology. Joshi (1955 : 36) had found fresh water gastropod shells in the Pleistocene deposits of the Malaprabha river. These shells were identified by the Geological Survey of India as of *Melanoides tuberculatius* (Miller). On the basis of similar evidence from Africa (Fuch, 1950), these shells seemed to be of middle Pleistocene age. Since no Palaeolithic implements were found in direct association with these shell bearing deposits, the occurrence of these shells in the sediments, had a restricted significance.

In Himachal Pradesh of the Sirsa river terraces at Nalagarh (Bhatia and Mathur, 1971 : 280-285) fresh water molluscan shells have been found and are dated to late Pleistocene. On the basis of this evidence (Joshi 1979: 12) had shown that the Acheulian industry from terrace III of the Banganga river at Kangra could be dated to upper Pleistocene.

Kajale (1979 : 66-68) has found molluscan shells from several localities such as Inamgaon, Chinchani and Annapur on the Ghod river. These have been identified as *Unio* and *turitella* species which were collected from blocks of sandy pebbly gravel and shallow muddy or sandy bottoms of the water bodies. The shells found from these sandy pebbly gravels at Inamgaon have been dated to c. 20,000 B.P. (Agrawal and Kusumgar, 1974).

Recently fresh water molluscan shells, particularly *Unio* sp. and Turitella sp. were also found from exposed sands and clays along the banks of Manjra (Joshi *et al* 1979) a major tributary of Godavari. These were found alongwith the fossils of elephants. The predominance of elephant fossils and calcerated moderately sorted pebbly gravels overlain by silty clay and clayey sand represent a low energy depositional environment characteristic of ox-bow lakes in the flood plains of Manjra in the past (Badam, 1979 : 198-99).

During explorations of the Mahanadi valley a number of molluscan shells have also been discovered. These are mainly four genera : *Turitella*, *Lymnea*, *Planorbis* and *Pila*. The fossils come from two localities namely Simga (*Turitella* and *Lymnea*) and Tanhkapar (*Planorbis* and *Pila*) and represent two different stratigraphical horizons.

(1) At Simga, the shells were found in the high level gravels in association with the upper Palaeolithic tools. Among these some had been found *in situ* and some were scattered on exposed surface of the gravel.

(2) At Tanhkapar, these were found in the alluvial section alongwith the Mesolithic tools. For the description of the specimens, reference has been made to Schrock and Twenhofel (1953), Woods (1973) and Zittal (1953).

Here only preliminary morphological description is given :

*Systematic Palaeontology*

Phylum : Mollusca
Class : Gastropoda
Order : Prosobranchiata
Sub-order : Pectinibranciata
Family : Turretelligae
Genus : Turitella

The shells are elongated and turretted. The spire is much longer than the lost whorl. No comments can be offered about the apex as it is not preserved in any of the specimens. The ornamentation consists of both, spiral and transverse elements. The spiral ornamentation consists of fine thread like lines whereas the transverse ornamentation consists of somewhat thicker ridges. The aperture is ovate which is highly notched at the posterior but almost rounded towards anterior. Umbilicus is absent in all the cases. This genera is reported only from Simga. (*Plate 33d*).

Phylum : Mollusca
Class : Gastropoda
Order : Pulmonata
Family : Lymnaeidae
Genus : *Lymnea*

The shells of this group are very thin generally having ovid shape. In these specimens the spire is slightly longer than, or as long as the whorl. The external surface of the shell is smooth without any ornamentation. The aperture is almost entire except for a notch like indentation towards the posterior of the aperture. A very small umbilicus is present. The shells of this genera are found on both the sites Simga and Tanhkapar (*Plate 33b*).

Phylum : Mollusca
Class : Gastropoda
Order : Pulmonata
Family : Lymnaeidae
Genus : *Planorbis*

The shells of this group are very thin with a flat discoidal form as the disc is traced from the centre to the periphery. The thickness goes on increasing. (*Plate 33c*)

| | |
|---|---|
| Phylum | : Mollusca |
| Class | : Castropoda |
| Order | : Pulmonata |
| Family | : Lymnaeidae |
| Genus | : Pila |

The shells of this group are also very thin and the spire is much shorter than the last whorl and have globular form. A small umbilicus is present. The individual whorls are convex and smooth without any ornamentation. The aperture is large wider anteriorly and without any thickness. This Genera is represented only at Tanhkapar (*Plate 33a*).

CHAPTER 3

# The Palaeolithic Cultures

## A. Terminology

*"Man's earliest essays in culture are best traced through his artifacts of flint or other kinds of stone. These were not only the most effective tools available to primitive man, controlling what he was able to achieve in shaping materials like bone or wood, but, being abundant and almost imperishable, they provide the only continuous series of cultural fossils."*

G. Clark & S. Piggott 1976 : 33

Although the prehistoric research in India is over a hundred years old, the question of technology palaeolithic cultures is still being debated practically at every seminar. After the discovery of first palaeolith (cleaver) in 1863 Robert Bruce Foote had difficulty to provide it a proper frame of terminology. He tried to fix archaeological antiquities into the Palaeolithic, the Neolithic, the Early and late Iron ages (1916). However, later explorations and surveys proved the existence of varieties of new evidences such as Mesolithic which could not find the place in this model. This was modified by Commiade and Burkitt (1930) by introducing terms like Series I (Lower Palaeolithic), Series II (Middle Palaeolithic), Series III (Upper Palaeolithic) and Series IV (Mesolithic) for the pre-Neolithic cultures. But when Indian cultures are compared with those of western countries this terminology was found unsuitable. In the meanwhile Dr. H.D. Sankalia (1956 : 35-53) discovered a sequence of three cultures at Nevasa on Pravara river which was comparable to Series II and III. After the explorations in other regions such as Karnataka (Banerjee 1957 : 218-60), Malwa (Khatri, 1958 : 161-180), Narmada (Sankalia *et al.* 1958 : 37-41), and Kurnool (IAR 1957-58) Series II industries were brought to light in stratified content and were in reality Middle Palaeolithic or Middle Stone Age cultures. This industrial complex was also designated as 'Nevasian' by Dr. K.D. Banerjee (1957 : 135-42). But the proper evidence of Series III was still inadequately known. Subbarao (1958 : 50-82) in his book 'Personality of India' introduced another three fold model of Early, Middle and Late Stone Ages similar to that of the then current African Stone Age terminology. He suggested a single term Middle Stone Age for the Series II and III. At the first Asian Archaeological Conference held at New Delhi in 1962 the question of terminology was again discussed at length and it was decided to follow the three fold model of the African Stone Age terminology. This was indeed suited to our the then known cultures. But differences in the use of terminology still persisted among the scholars. Sankalia (1960) suggested that cultural horizons named as Sohanian-Madrasian and Nevasian should be designated as Lower and Middle Palaeolithic respectively whereas Misra (1962 : 113-24) proposed Stone Age cultural divisions into Early, Middle Palaeolithic and Mesolithic.

There was however no provision for the 'blade and burin' industries which typologically were akin to upper Palaeolithic cultures of Europe. Later on the evidences of an industry having a distinct character started turning up. This industry was different from that of the Middle Palaeolithic and Mesolithic and was characterised by blade and burin elements. The discovery of such industries from the Kurnool area, Andhra Pradesh, (Murty, 1968 : 1970-90) Shorapur Doab in Karnataka (Paddayya, 1968 : 68-79) Visadi in Gujarat (Allchins, 1973 : 18-21) and Belan valley in Uttar Pradesh (Sharma 1980 : 89-115) proved its presence in different parts of India. The question of terminology was therefore again discussed

in 1964 at the seminar on Prehistory held at Poona and at another seminar in 1972 held at Bombay. Finally it was resolved to follow the European terminology of Lower Palaeolithic, Middle Palaeolithic, Upper Palaeolithic and Mesolithic. It is however pertinent to note that this decision was not final as is evident from the remarks of A. Ghosh, Director General, Archaeological Survey of India "the time is still not mature to adopt the terms the Middle Palaeolithic and the Upper Palaeolithic in Indian Prehistory, the 1961 terms should continue till we have much more evidence in favour of the terms". (1973 : 31)

I have adopted the latest terminology (Sankalia 1974 : 77-276) for discussing the palaeolithic cultures of the upper Mahanadi valley. This has become necessary to facilitate comparative study of cultures of different regions in India. The Mahanadi valley has also yielded a distinct culture which chronologically falls between Middle Palaeolithic and Mesolithic which according to the terminology followed by me belongs to upper Palaeolithic culture. It would be interesting to note here, however, that in 1978 when Dr. Desmond Clark, during his visit to India, after seeing the collections of Middle Palaeolithic and Upper Palaeolithic of the upper Mahanadi valley as well as the similar collections at the Deccan College Research Institute, Pune had expressed that both these groups of industries showed similarity with Middle Stone Age cultures of Africa.

## B. Lower Palaeolithic Culture

The Lower Palaeolithic cultures are very sparingly represented in the upper Mahanadi valley. In fact earlier work in the other parts of this river had also not yielded rich evidence of this culture (Mohapatra 1962 : 60-92, Tripathy 1974 : 44-64) (Fig. 20)

In the upper Mahanadi valley the evidences of this culture come from three open air stations : Haradula, Bhilai and Chandarpur. These sites are situated on the Mahanadi river near the outcrops of Archaeans and Cudappah formations. The tributaries did not yield any site of this culture. These sites are located on the right bank of the Mahanadi, sometimes almost on the bank and sometimes 2-3 km. away from the present course of the river. The tools were obtained at the foot and slope of the hills and a few were collected from the gullies formed at the base of the hills. The collection includes 33 tools. Of these 23 are from Bhilai, 4 are from Haradula and 3 from Chandarpur.

The artifacts are fashioned on cores and flakes. They could be divided in two broad categories viz. shaped tools and simple artifacts. Shaped tools are 13 and simple artifacts are 17. These can further be divided in sub groups such as choppers (both unifacial and bifacial), handaxe, cleaver scrapers, flakes, cores hammer-stones. The collection does not contain any standardized forms of handaxes and cleavers of the Lower Palaeolithic culture. However, two specimens closely resemble pointed ovate or almond shaped handaxes and a cleaver with an oblique cutting edge. Such pieces have been classified as handaxe and flake-cleaver in the present collection. Site and typewise distribution is given in the Table 15.

Small sub-triangular or ovate types of handaxes were obtained alongwith the Middle Palaeolithic tools (see in Chapter 3 C). The latter are made on chert and represent a late Acheulian stage. The occurrence of Lower Palaeolithic in this region is thus confirmed.

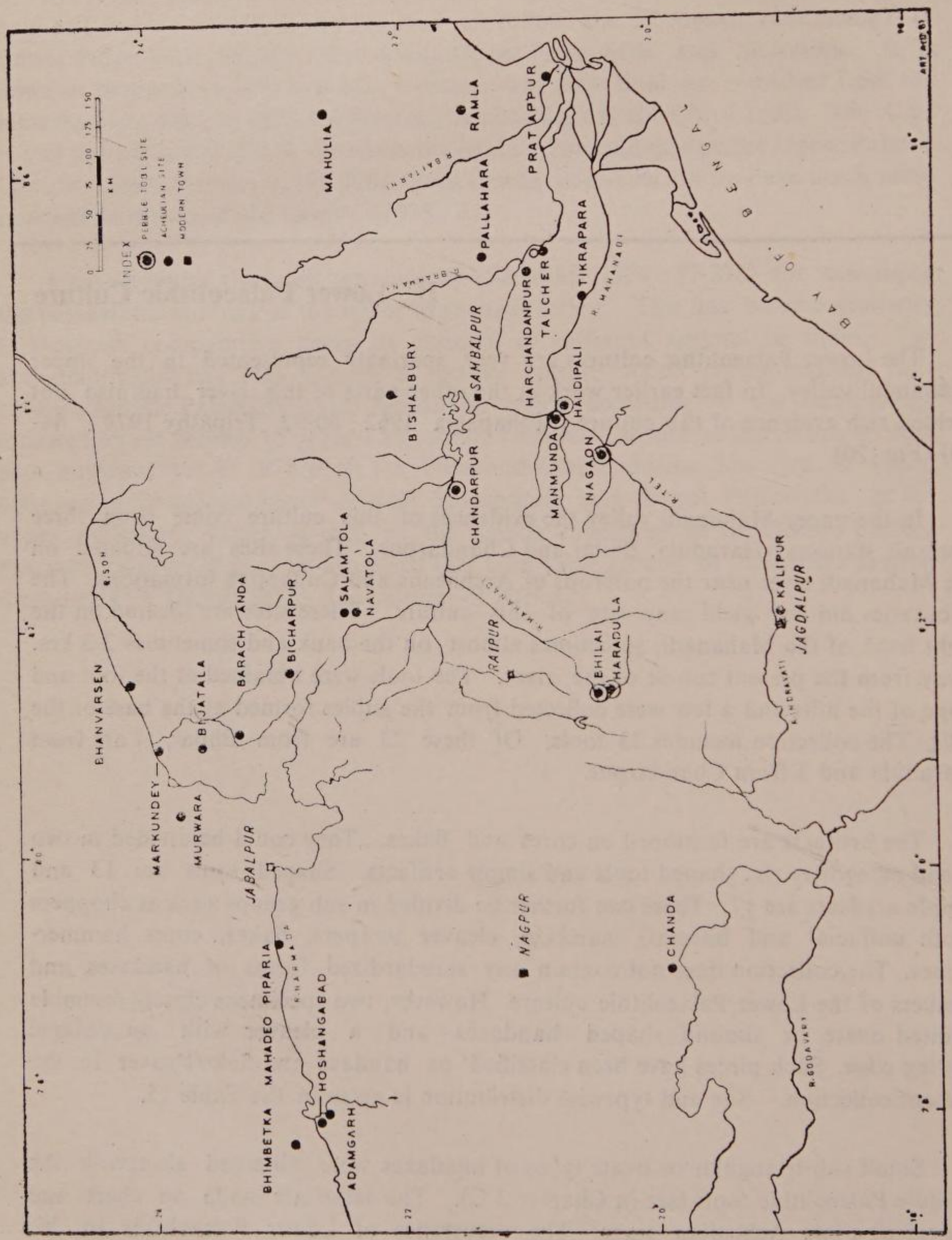



**Fig. 20. Lower Palaeolithic sites around Mahanadi valley**

TABLE 15

**Site-wise and type-wise distribution of the Lower Palaeolithic tools**

**Shaped tools**

| *Tool types* | *Site* | | | | |
|---|---|---|---|---|---|
| | Bhilai | Haradula | Chandarpur | | % |
| Unifacial chopper | 3 | — | 3 | 6 | |
| Bifacial chopper | 3 | — | — | 3 | 69.24 |
| Handaxe | 1 | — | — | 1 | 7.69 |
| Flake-cleaver | — | 1 | — | 1 | 7.69 |
| Scraper | 1 | 1 | — | 2 | 15.38 |
| Total | 8 | 2 | 3 | 13 | 100.00 |
| **Simple artifacts** | | | | | |
| End flake | 4 | — | — | 4 | |
| Side flake | 3 | — | — | 3 | |
| Indeterminate flake | 2 | 1 | — | 3 | 58.82 |
| Core | 4 | 1 | — | 5 | 29.41 |
| Hammerstone | 2 | — | — | 2 | 11.77 |
| Total | 15 | 2 | — | 17 | 100.00 |
| | | | Grand Total | 30 | |

**Raw material and state of preservation**

The tools of this culture are made of four types of raw material : dyke rock (dolerite), quartzite, quartz and indurated shale. The dyke is the predominant raw material used in the manufacture of the tools and quartzite comes next in order whereas shale and quartz are rarely utilized.

These rocks are found near the sites. The dolerite type and quartzite occur in the form of boulders, the quartz as veins in the Archaeans and shale have been exposed at several places. The percentage of the raw material used in this industry is given below :

| *Raw material* | *Number* | *Percentage* |
|---|---|---|
| Dolerite | 16 | 53.33 |
| Quartzite | 10 | 33.33 |
| Quartz | 3 | 10.00 |
| Shale | 1 | 3.34 |
| Total | 30 | 100.00 |

The tools found at Haradula and Chandarpur are generally fresh and are made on quartzite and shale rocks, whereas the tools from Bhilai are on dolerite dyke and quartzite rocks which were found on lateritic surface at the foot of the hill. These tools are generally patinated sometimes with thick reddish coating. In the collection 12 (41.38) tools are fresh, 14 (48.27%) are moderately patinated and 3 (10.35%) are highly patinated.

The tools are mostly unrolled (27 : 89.65%) and have got sharp ridges and clear retouching. Only a few tools collected from the gullies show some amount of rolling (3 : 10.35%).

As has been stated earlier, the tools are fashioned on both cores and flakes but core-tools are more in comparison with the flake tools. The core tools include choppers whereas flake tools are handaxe, flake-cleaver and scraper.

**Technology**

The choppers made on boulders or massive pebbles are of unifacial type and are worked resulting in smaller and shallower as well as deep flake-scars. There are some unifacial choppers which bear stepped scars also. All the bifacial choppers are worked on chunks and have been flaked on both the surfaces.

The flake tools are made on both end-and side-flakes generally having the scars of different sizes all over the dorsal surface whereas a few flakes have been cortex also. The edges of the tools have been obtained by regular flaking along the margins.

The flakes show narrow and small unworked platforms with prominent or defused bulbs of percussion. None of the flakes has a facetted platform. Some of the tools do not show bulbs and platforms due to extensive secondary flaking.

**Typology and description of the illustrated tools**

The entire collection has been divided into two groups : Shaped tools and simple artifacts and is further classified in various types. Shaped tools in the collec-

tion include choppers, handaxe and flake-cleaver whereas simple artifacts are divided into flakes, cores and hammerstones.

**Shaped tools** : (12 specimens : 40.06%)

The tools of this group have been found at all the sites. Bhilai yielded choppers and a handaxe, Haradula a solitary flake-cleaver and a scraper and Chandarpur only choppers. These are dealt in detail in the following pages.

(a) *Choppers* : (9.31.03%)

These can also be named 'Pebble tools' as most of them are often made on river worn pebbles. On the basis of unifacial and bifacial working the tools have been divided into two categories : choppers and chopping tools.

The term choppers and chopping tools was originally used by Movious (1944 : 41, 1948 : 329-420) in the context of Asian and South Asian prehistory. He made a distinction between the two on the basis of the working to form suitable edges. According to him single edged unifacially worked tools made on cores are the choppers whereas single edged bifacially worked tools made on pebbles or chunks are chopping tools. For distinguishing choppers from those of scrapers, the difference in size was mainly considered. The smaller tools made on flakes and cores were termed as 'scrapers' whereas large and massive tools as choppers and chopping tools, Sen (1957 : 157-59) laid more stress on the function and not on the size for distinguishing choppers and scrapers while Misra (1967 : 26) combined both the types together and termed the groups as chopper/scraper but Paterson and Drummond (1962 : 98-100) without taking size and function into consideration gave more emphasis on shape and technique. According to Sankalia (1957 : 162) scrapers are large flakes having edges parallel to the longer axis with a properly prepared back for convenience of grip but choppers are heavy massive pieces having similar nature made on cores.

Joshi (1980 : 18) has distinguished the choppers and chopping tools : the choppers are those having unidirectional flaking and chopping tools with bidirectional one. As the function of both the types are the same, he proposes the terms unifacial and bifacial choppers instead of choppers and chopping tools. Functionally the scrapers are used for different purposes and thus they form a separate group.

There are 9 choppers in the collection. On the basis of natural flaking i.e. unidirectional or bidirectional, the choppers are divided in two major groups.

(a) Unifacial choppers
(b) Bifacial choppers

*Unifacial choppers* : (6 specimens)

This group comprises of 6 specimens. Among these 5 are made on quartzite pebbles and a solitary example is on the shale rock. These are worked on the narrow and wider portions on one end and on one of the sides as a result of which convex and straight working edges have been obtained. Out of 6 specimens, 4 are worked on their ends and remaining are on the sides. In the side choppers the working is very steep and they bear steeped scars. The remaining portions of the choppers in most of the cases are intact (cortex). The size of these ranges from 115×75×61 mm to 101×93×46 mm. Taking into consideration the working along these margin these have been divided in two sub-groups :

(1) End choppers
(2) Side choppers

*BLI-2* (Fig. 21.1)

It is an end chopper made on an oval shaped pebble of coarse grained brown quartzite. A few deep and some small shallow flakes, crude in nature have been detached from the wider portion to obtain a chopper edge. The remaining portion of the tool is pebble cortex. The working edge is convex (95 mm). The tool is fresh but slightly patinated to a brown colour. (102×92×60 mm).

*BLI-3* (Fig. 21.2)

An end chopper is made on sub-rounded reddish quartzite pebble. Half of the pebble is flaked off unidirectionally resulting a convex edge. The flake-scars over the tool are shallow and smaller in size, leaving rest of the portion of rounded pebble cortex which could have served as suitable grip. Fresh but patinated.

*BLI-I* (Fig. 21.3)

It is a side chopper fashioned on the flat-based thick round pebble of brown quartzite. Half of the pebble is worked on the periphery. Flake-scars have been struck-off from bottom upwards resulting in stepped scars. Some irregular flakes have also been detached towards the top. The working edge is convex (110 mm) Fresh. (90×112×105 mm).

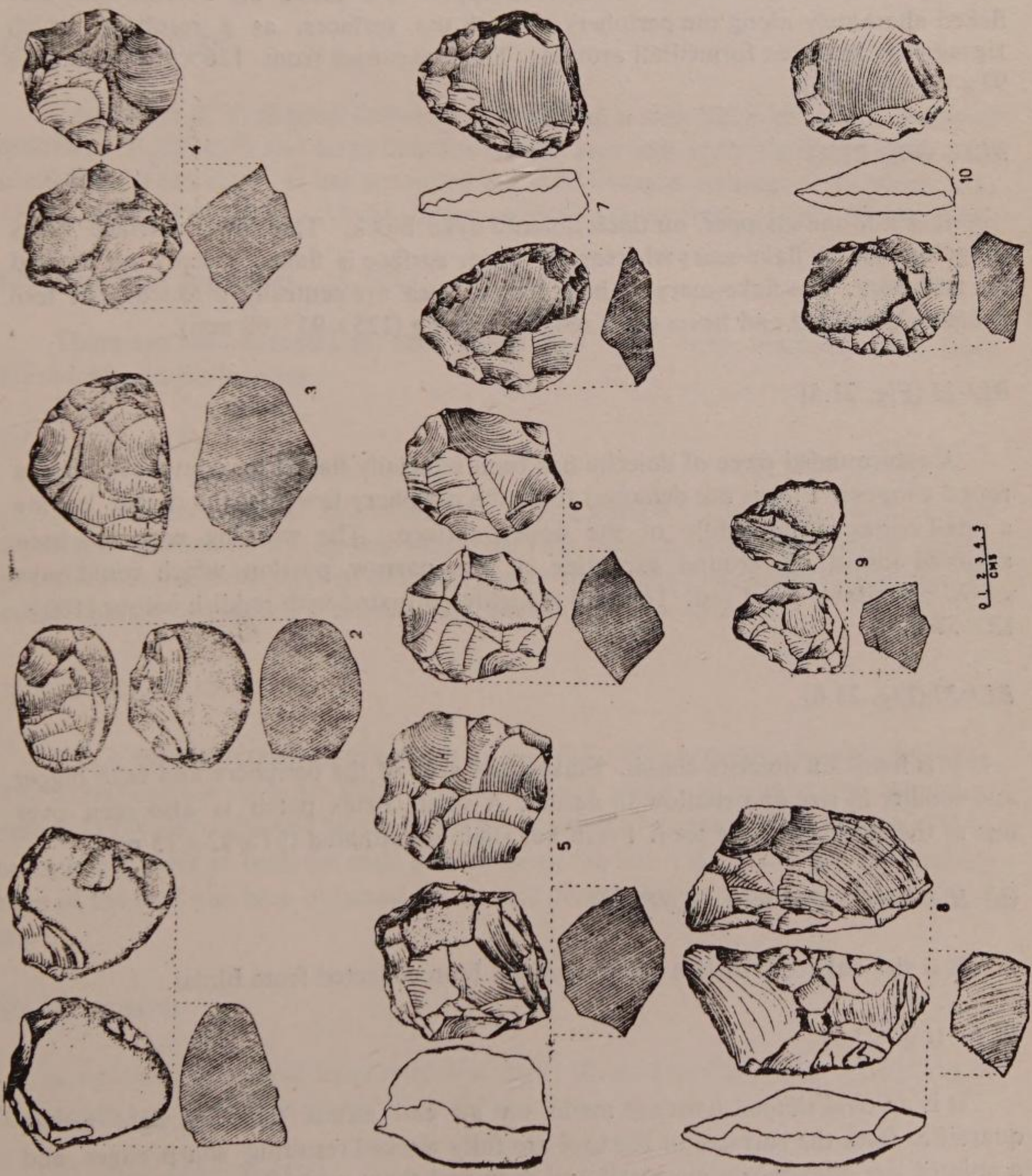


Fig. 21. Lower Palaeolithic Tools

*Bifacial choppers* : (3 specimens)

This group also contains a small number of tools and has been represented by three specimens only. All the bifacial choppers are made on dolerite dyke and flaked alternately along the periphery on both the surfaces, as a result of which zigzag edge has been formed all around. The size ranges from 126×95×60 mm to 97×92×75 mm.)

*BLI-6* (Fig. 21.4)

It is a round chopper, on thick dolerite dyke block. The lower surface bears irregular shallow flake-scars whereas the upper surface is flaked steeply all around the periphery. The flake-scars on both the surfaces are centrally directed. The tool is highly patinated and bears thick reddish coating (125×95×60 mm).

*BLI-21* (Fig. 21.5)

A sub-rounded piece of dolerite has been bifacially flaked to convert it into a round chopper. Flakes are detached from the periphery towards the centre leaving a small cortex in the middle of the upper surface. The working edge has been achieved almost all around excepting at the narrow portion which could have served as suitable hand rest. The tool is highly patinated with reddish colour (100×82×58 mm).

*BLI-20* (Fig. 21.6)

It is made on dolerite chunk. Flake-scars around the periphery and both bigger and smaller in size and shallow in nature. A small cortex patch is also seen over one of the surfaces of the tool. Fresh but slightly patinated (97×92×75 mm).

(b) *Handaxe* (1 specimen : 7.69%)

It is the only tool of this group and has been collected from Bhilai.

*BLI-7* (Fig. 21.7)

It is an oval shaped handaxe made on an end struck flake of light brown quartzite. Both the surfaces of the tool are fully worked resulting sharp edges and a pointed tip. Flake-scars are small and deep and show steep flaking. Cross-section sub-triangular. Fresh but slightly patinated (115×90×30 mm).

(c) *Flake-cleaver* : (1 specimen : 7.69)

It is also the only example of a cleaver like tool and was found at the Haradula site.

*HDL-5* (Fig. 21.8)

The tool is a 'V' shaped flake-cleaver made on a side flake of chocolate brown quartzite. Both small and large flakes scars are seen on both surfaces. Bulb and platform are not clear. It has a pointed butt and oblique cutting edge which also carries utilization marks. Cross section squarish. Quite fresh. (147×90×45 mm),

(d) *Scraper* (2 specimens : 15.38%)

There are two examples in this group and have been obtained each from Haradula and Bhilai sites.

*BLI-5* (Fig. 21.9)

It is a convex scraper fashioned on a quartz nodule. The upper surface show a patch of cortex and a long scar along the left margin while the under surface possesses several flake scars of different sizes. It has been retouched along the left dorsal margin to prepare a convex edge. Fresh (70×55×45 mm).

*HDL-1* (Fig. 21.10)

It is a convex scraper prepared on an end flake of chocolate brown quartzite. The dorsal surface possesses flake scars of various sizes all around the periphery except at the proximal end where it has got a patch of cortex. Ventral surface also bears a few scars at both the ends as well as on the left side. The convex scraping edge of the tool has been obtained on the left dorsal margin. Fresh. (104×74×33 mm).

**Simple artifacts**

Simple artifacts come from only two sites : Bhilai and Haradula. They are 18 in number and have been classified in three categories :

(1) Cores (5 : 29.41%)
(2) Flakes (10 : 58.82%)
(3) Hammer-stones (2 : 11.77%)

(a) *Cores* (5 specimens 29.41%)

There are only five cores in the collection. Generally massive blocks of quartzite and dolerite dyke have been selected for striking off the flakes of different sizes. The cores on dyke rock are dominant (3) and on quartzite material are rare (2). Excepting into one case all the cores are flaked all over and show the removal of flakes of various sizes. The scars are generally shallow and some among them carry centrally directed flake scars. One core in the collection is flaked partly and possesses only a few scars on it. The size of the cores varies from $100\times92\times65$ to $85\times72\times47$ mm.

All the cores of the present collection are flake cores. It is worth mentioning that sizes of the some of the flakes described on the next pages are larger than the cores described here. Some huge cores were found at the site but it was not possible to collect them. Such pieces were photographed and left at the site.

*BLI-22* (Fig. 22.1)

It is a flake core on the dolerite dyke material. The core has roughly circular outline and carries shallow and small flake scars all over the body. It is highly patinated and wheathered ($87\times77\times67$ mm).

*BLI-19* (Fig. 22.2)

A block of dolerite dyke rock has been flaked on both the surfaces. Upper surface shows the removal of some parallel flakes covering from one end to another and some smaller flakes at both the ends, leaving cortex at and the centre. The ventral surface retains comparatively wider and centrally directed flake scars. The core is unrolled but has little patination over it ($100\times92\times65$ mm).

*HDL-3* (Fig. 23.3)

A chocolate brown quartzite piece has been flaked over both surfaces. The upper surface carries several deep flake scars while on the lower surface are a large flake scar in the centre and several smaller flake scars along the margin. Fresh ($85\times72\times47$ mm).

(b) *Flakes* (10 specimens 29.41%)

There are ten flakes in the collection. Of these nine are from Bhilai which are detached from dolerite dyke rock whereas a solitary flake of quartzite is from

Haradula. All the flakes from dolerite dyke rocks are patinated to a reddish colour. The dorsal surface of each specimen shows flake scars of different sizes both shallow and deep in nature. A few of them carry centrally directed flake scars indicating their removal from a prepared core. All the flakes have a primary flake surface at their dorsal side. The bulbs on some of the flake surface at their dorsal side. The bulbs on some of the flakes are prominent but there are some examples which show defused bulbs of percussion. The angles of the platforms vary from 112°-129°. The platforms are generally narrow and plain. None of the flakes have faceted platform. In some of the flakes both bulb and platform are missing. All the flakes are divided in three sub groups.

End flakes (4 specimens)
Side flakes (3 specimens)
Intermediate flakes (3 specimens)

*BLI-10* (Fig. 22.8)

It is an end flake of ovoid shape, on dolerite. The dorsal surface bears crude centrally directed flake scars and ventral surface retain defused bulb and plain primary flake surface. A plain narrow platform is seen at the proximal end. The flake is unrolled but is patinated to reddish colour (100×90×30 mm).

*BLI-12* (Fig. 22.5)

It is a sub triangular end flake from dolerite dyke rock. More than half of the dorsal surface carries shallow flake scars, leaving the rest as cortex. The ventral surface has a prominent bulb of percussion and plain striking platform. The flake is fresh but slightly patinated. (90×55×27 mm).

*BLI-8* (Fig. 22.6)

It is roughly squarish side flake of dolerite dyke material. The dorsal retains a deep and several shallow flake scars of various sizes leaving small cortex at distal as well as proximal ends. The ventral surface is plain and shows removal of a small flake due to which part of bulb is chipped off. The flake is patinated to black-ish colour. Fresh (100×119×33 mm).

*BLI-25* (Fig. 22.9)

It is a small side flake struck from a dolerite dyke rock. On the upper surface are seen generally smaller deep flake scars, resulted due to removal of flakes from

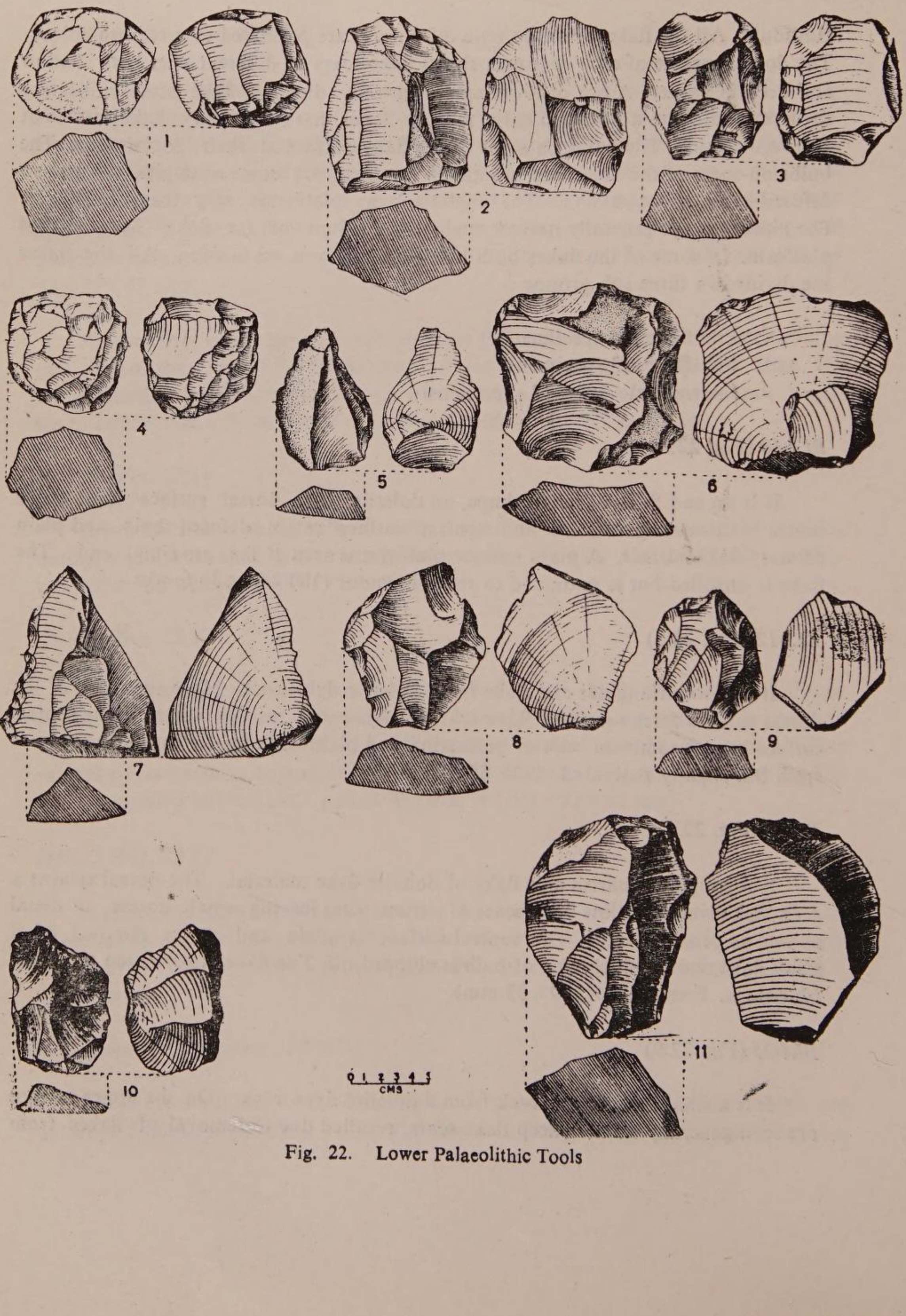



Fig. 22. Lower Palaeolithic Tools

margin towards centre, are seen. Under surface bears a thin bulb and a long bulbar scar covering from one end to another. The platform of the flake is narrow and unfaceted. The flake is unrolled but has got patination over it (60×95×18 mm).

*BLI-24* (Fig. 22.7)

A side struck triangular flake of dolerite dyke material. On the dorsal surface longer flakes have been detached and left lateral margin bears utilization marks. On the opposite side is the primary flake surface with prominent bulb and plain striking platform. The flake is in fresh state of preservation (95×120×35 mm).

*BLI-9* (Fig. 22.9)

An indeterminate flake is struck off from the dolerite dyke material. The dorsal surface is fully flaked and has got plain ventral surface. Bulb and platform of the flake are not easily visible. This specimen shows some amount of rolling (68×67×25 mm).

*HDL-2*

It is a thick indeterminate flake on light brown quartzite. Upper surface retains one long and several small flake scars. The margin has got indentation perhaps due to use. A few flake scars are also seen on the under surface. The flake is fresh (140×106×59 mm).

C. *Hammerstones* (2 specimens : 11.77%)

There are only two specimens of hammer stones from the Bhilai site. Among them one is made on quartz and another is on quartzite material. There are no regular flake scars over these specimens but irregular battering marks probably due to use.

## DISCUSSION

In the foregoing pages the Lower Palaeolithic industry from the upper Mahanadi comprising mainly choppers has been described. Since choppers occur at all the stages of Palaeolithic industries, the question arises of their proper cultural identification particularly when no other data are available for distinguishing them. On the basis of techno-typological comparison and the use of raw material employed for the choppers of different industries, the writer has tried to analyse the

above mentioned problem. All the tools of Lower Palaeolithic are heavier and their length breadth and thickness are more in comparison with those of the Middle Palaeolihic. Flake-scars are larger in size and are cruder in nature. These afore-said characters place the chopper industry of the upper Mahanadi earlier than that of the Middle Palaeolithic industry. The raw material in the Lower Palaeolithic is dominantly dolerite and quartzite whereas in the Middle Palaeolithic collections they are mainly fashioned on crypto-crystalline silica.

The Lower Palaeolithic of the upper Mahanadi valley exhibits an interesting picture in Central India. This industry mainly comprises core tools and a few tools made on flakes. Among the regular tools the pebble or core-tools are greater in number. The raw material on which these tools are made deserve particular mention. Most of the Lower Palaeolithic industries of Indian sub-continent are fashioned on quartzite material but at places some different raw material has been used.

The Son (Ahmad, 1966: 77) and the Narmada (Supekar 1968: 81) in the north of Mahanadi, the Baitarni, the Brahmani (Mohapatra 1962: 60-92) and the Tel river (Tripathy 1972: 44-60) in the east and Chanda (IAR 1959-60: 31, 60-61: 2 and 61-62: 30) in the west are the areas where quartzite as raw material has been employed for manufacturing the Lower Palaeolithic industry. At Lalitpur in U.P. (Singh 1965 : 66-79) tools are fashioned on granite while at some sites like-Chirki-Nevasa in Maharashtra (Carvinus, 1968: 16-18) and Assam (Sharma & Roy 1978) they are made on red and grey basalts and dolerite. In Karnataka at Hunsgi (Paddayya 1977: 383-400) they are on limestone while in Kerala (Rajendran, 1979: 79-101) quartz has been used. In the Mahanadi valley some of the tools are on quartzite like those in the neighbouring areas but some are made on dolerites and quartz both of which are easily obtainable in the adjoining hills.

In the early days of prehistoric studies in India two different tool traditions: Chopper-chopping and biface had been thought of (Movius 1944: 20, 1948: 329-420) and termed as Sohanian and Madrasian respectively. The former had its implications of cultures which flourished in southeast Asia (Movius 1957: 149-56) and latter in Africa and western Europe. Considering these evidences as two distinct cultures their occurrence at the same site was explained as due to migration or diffusion (De Terra and Paterson 1939) Krishnaswami, 1947: 11-57, Soundara Rajan 1961: 68-85) but this hypothesis is no more tenable as later discoveries proved the existence of both the tool types at almost all the sites in India.

After getting an admixture of choppers and bifaces, it was also thought that the biface industries evolved from the chopper or pebble industries as at Olduvai

Gorge in Africa. Thus Khatri (1962: 86-96) on the basis of his discoveries in the Narmada valley regards separate existence of 'Pebble Tool' culture designated by him as 'Mahadevian' after the type site of Mahadeo Piparia on the Narmada. However, the later excavations carried out by Supekar (1968: 134-193) at the same site could not confirm the separate horizon of Mahadevian culture. The excavations revealed the occurrence of bifaces along with choppers. Some Middle Palaeolithic tools were also found in the excavated deposits.

The Pebble or Core industries are known from several sites in India. Among them are Nalagarh (Sen 1955: 177-184); Beas and Banganga valley (Lal 1956: 58-92 and Joshi 1968: 96-99) in Himachal Pradesh: Lahchura in Uttar Pradesh (Pant 1968: 114-142); Bhimbetka in Madhya Pradesh (Wakankar 1973: 23-33); Tel valley in south-western Orissa (Tripathy 1972 : 44-65); Konkan in Maharashtra (Joshi and Bopardikar 1972: 47-51 and Guzder, 1977: 104-111); Nittur in Karnataka (Ansari 1970: 1-7) and Palghat in Kerala (Rajendran 1979: 110-128).

The stratigraphical horizon of most of these sites are still not clear. The Pebble tools at the site of Nittur occur alongwith the bones of *Bos namadicus* and the writer himself admits that the stratigraphical position is not clear. In Konkan, though some of them come from stratified deposits, their chronology could not be established. In Orissa (Tripathy, 1972: 44-64) they have been found from a lower gravel, stratigraphically occurring below the Middle Palaeolithic horizon (Flake industry). Bhimbetka is the only site where pebble tools occur at the base below Acheulian strata (Wakankar 1973: 23-33). Recently Wakankar (1978) has discovered some more sites yielding pebble tools without bifaces underlying the Acheulian deposit.

As has been mentioned above, the Indian Lower Palaeolithic industries sometimes yield a mixed industry comprising pebble tools and bifaces. The Acheulian industries are spread almost all over the Indian sub-continent excepting the west coast region.

The Acheulian sites generally occur in three ecological conditions.

(i) Hill slope or foot hill sites
(ii) River gravel or river bank sites
(iii) Cave or rock shelter sites.

All the above mentioned group of sites have yielded choppers alongwith the Acheulian tools and sometimes the percentage of choppers is as high as 40% (Isaac 1960: 29). The sites yielding choppers and Acheulian tools are Lalitpur (Singh,

1965: 66-79) ; Singrauli basin (Krishnaswami and Soundara Rajan 1951: 40-65); Nihi, Gopipur and Mahugarh (Pant 1978) in Uttar Pradesh; Paisara (Pant *et al.* 1978: 22) in Bihar; Mayurbhanj region (Bose and Sen 1948), (Bose *et al.* 1958: 49-55); The Brahmani and the Baitarni valleys (Mohapatra 1962: 60-92) in Orissa; Giddalur (Soundara Rajan 1952: 64-92) Nagarjunakonda (Soundara Rajan 1958: 49-113) all in Andhra Pradesh; Vedamadurai (Krishnaswami 1930a : 58-90, 1938b 32-35, De Terra and Paterson, 1939: 329); Gudiam Cave (IAR 1962-63: 13, 1963-64: 19) and Attirampakkam (IAR 1964-65: 20-29) in Tamil Nadu; Hunsgi valley (Paddayya: 1977: 383-40) Malaprabha basin (Joshi 1955: 50-77) Krishna basin (Pappu 1974: 51-83) Tumkur district (Sheshadri, 1955; 271-278) in Karnataka: Chirki-Nevasa (Corvinus 1968: 216-218, Sankalia 1956: 35-53) and Chanda (IAR 1959-60: 31; 1960-61 : 2 and 1961-62: 30) in Maharashtra; Sabarmati valley (Sankalia 1946: 8-10, Subbarao 1952: 33-69) in Gujarat; Berach basin (Misra 1967: 23-66) in Rajasthan; Narmada (Supekar 1968: 80); Adamgarh (Joshi 1978: 14-17) and Son valley (Ahmed 1966: 75-106) in Madhya Pradesh.

The presence of choppers with Acheulian tools have also been confirmed by the excavations of a few Acheulian sites. The percentage of choppers, handaxes and cleavers from different excavated sites is given below,

TABLE 16

| *Site* | *Total finished tools* | *Choppers* | *Handaxes* | *Cleavers* |
|---|---|---|---|---|
| Lalitpur | 121 | 7.44 | 72.73 | 18.18 |
| Mahadeo Piparia | 336 | 49.11 | 5.06 | 4.77 |
| Adamgarh | 93 | 34.40 | 8.60 | 6.45 |
| Chirki-Nevasa | 1510 | 36.16 | 34.17 | 25.30 |
| Anangwadi | 94 | 35.11 | 28.72 | 13.77 |
| Hunsgi | 291 | 8.26 | 16.51 | 25.69 |

The above table shows that the percentage of choppers in the north and south India is fairly high and the earlier observation of Prof. B.B. Lal (1956: 89) that percentage of choppers reduces rapidly towards south and vice-versa for handaxes will have to be revised in the light of new evidences.

The Pebble tool industries showing better stratigraphical evidences come from Africa and Europe. The important sites are Olduvai Gorge (Leakey, 1971: 61-172) in Tanzania, Africa and Vallonnet (de Lumley *et al* 1963) in south France and Vertesszollos (Kretzoi and Vertes 1965: 74-87) in Hungry Europe which deserve particular mention. The Vallonnet cave site is regarded contemporary with those

of Olduvai Gorge bed II since both the sites preserve good faunal wealth Villafrancian fauna). The site of Vertesszollos, however shows typologically advanced stage and the Pebble tools here are much smaller in size (with an average of 2.5 cm in length), even though this site represents the earliest known evidence for the presence of man in Central Europe and extended over a long period during the Gunz-Mindel and the mindel glaciation (Middle Pleistocene).

The Pebble tool industries are also very well known from Asia. Among them are the Choukoutien (Movius 1948: 329-420) of China, the Anyathian of Burma (Movius 1948: 329-420) the Patjitanian of Jawa (Oakley 1969: 246-260) the Tampanian of Malaysia (Walker and Soneking, 1962: 103-139) and some industries of Thailand (Heider 1958 : 63-67). But some of these industries have also yielded some of the Acheulian forms such as flake-cleavers at locality 15 of Choukoutien and handaxes in Tampanian of Jawa.

The early Soan (De Terra and Paterson 1939) of Potwar region yields the the 'Pebble industry' alongwith the pebble tools, scrapers and proto-handaxes which also is the situation in the upper Mahanadi valley.

The evidences from different countries show that in some parts such as Europe and Africa, the pebble tools mark the evidence of earlier human activity. In India too, these are found at the earliest cultural levels and now several localities have been brought to light such as at Bhimbetka (Wakankar 1973: 23-33 and 1978) but there are some isolated patches like Tel valley (Tripathy 1972: 44-64) where pebble tools lie stratigraphically below the Middle Palaeolithic horizon and a few Acheulian tools like miniature handaxes have been found in the Lower Palaeolithic collection. To be more precise the upper Mahanadi also evidenced a solitary handaxe alongwith the Pebble industry. In the adjoining areas, rich Acheulian industries flourished and the distance between those sites and the sites of the upper Mahanadi area is not much (Fig. 20). In the Mahanadi area the Middle Palaeolithic industry has yielded advanced Acheulian forms such as choppers and handaxes suggesting the presence of Acheulian industries in the area.

The geomorphological observations made during the field seasons have helped to trace some reasons for the absence of Acheulian industry. A gravel bed as well as the tools were not recovered from the Mahanadi proper because the river bed is covered with thick sand. Due to the shallow nature of the river which is wide and shifting, the gravel as well as the tools might be lying somewhere under the alluvium.

The pebble tool industries are found from two different stratigraphical horizons as at Bhimbetka and Tel valley. The evolution of the Acheulian from the Pebble tool industries has not been noticed anywhere in India. Pant (1978) puts forward the possibility that some of the pebble tool industries of Peninsular India are contemporary with the Acheulian industries. This also could be applicable for the Pebble industry of the upper Mahanadi valley.

## C. Middle Palaeolithic Culture

This is one of the most widespread Palaeolithic culture in the upper Mahanadi valley. It is characterised by the abundant flake tools with a small percentage of core tools. The raw material used for the tools are variety of cryptocrystalline silica minerals possessing better concoidal fracture. The stratigraphical position of this industry is fairly clear in the area. In addition to the tools of this culture were obtained animal fossils which helped to fix the Stone Age chronology of the region. The fossils consist of *Bos*, *Equus* and *Ovis/Capra* and were removed from Gravel I on the Seonath. They indicate an upper Pleistocene horizon for the Middle Palaeolithic cultures of the valley.

The sites yielding these tools occur on the Mahanadi as well as on its tributaries like the Seonath and Hasdo. Three sites are on the Seonath, and one each on the Mahanadi and the Hasdo. The sites Somnath, Simga and Nandghat are situated on the Seonath, Chandarpur on the Mahanadi and Korba is on the Hasdo river. The tools of this industry are found in the river gravels and sometimes right on the banks of the rivers. They were also obtained from the undisturbed gravels exposed in the river sections. Excepting one, all the sites are situated on the plain whereas at Chandarpur the tools were found on the slope.

The tools associated with the river gravels, are little abraded showing that they had not been subjected to long distance transport in the river but are derived from the sediments exposed in the adjacent cliff sections.

The assemblage from each locality has separately been analysed and tabulated (Table 17) in two main categories: shaped tools (139: 41.12%) and simple artifacts (199: 58.88%). Each type has further been divided into several sub-groups on the basis of working and shape of the tool.

| *Shaped tools* | *Simple artifacts* |
|---|---|
| Choppers | Cores |
| Handaxes | Flakes |
| Scrapers | Flake-blades |

| *Shaped tools* | *Simple artifacts* |
|---|---|
| Scraper-cum-borers | Unworked blades |
| Borers | Chips |
| Points | Hammerstones |
| Worked blades | Worked nodules |

**Raw Material and state of Preservation**

Although some of the pieces are on quartzite the early man of the Middle Palaeolithic culture seems to have preferred fine grained material.

The raw material-wise distribution is given below :

| *Raw material* | *Total number of tools* | *Percentage* |
|---|---|---|
| Quartzite | 4 | 1.18 |
| Chert | 164 | 48.53 |
| Chalcedony | 151 | 44.67 |
| Quartz | 10 | 2.96 |
| Jasper | 8 | 2.36 |
| Shale | 1 | .30 |
| Total | 338 | 100.00 |

All the sites of this culture are found in the vicinity of Cudappah rock but generally they are away from the source of raw material. The quartzite on which some of the tools are made is found in the source region of the rivers from where it was transported by the river and eventually picked up by the prehistoric man for manufacturing tools. The Chandarpur site is however, located on the slope of quartzite hill. The outcrops of silica family minerals on which the majority of the tools are manufactured could not be traced anywhere in the region under study. These are probably derived from the Inter Trappean beds occurring in the catchment area of the Seonath and its tributaries, the pebbles of which got into the gravels and were later used by early man. No tools have been made on the dolerite rock which is common in this area and has been used for the Lower Palaeolithic Industry.

Many tools of this assemblage show patination. The tools made on chert and chalcedony carry glassy yellowish patination. A few tools are slightly weathered but on breaking the inner core of the minerals was found fresh. Some tools of the collection possess whitish patches and gravelly incrustations.

## Technology

Middle Palaeolithic is basically a flake culture as the majority of the tools are fashioned on flakes. The simple flakes and those which have been retouched show generally plain platforms which are either narrow or broad. The majority of the flakes have defused bulbs of percussion and only a few show prominent positive bulbs. These must have been produced by the stone hammer technique. Some flakes have faceted platforms and centrally directed regular flake scars over their dorsal surfaces which indicate that the cores were properly dressed and platforms were carefully prepared before striking off such flakes. A few blades possess tiny bulbs and narrow platforms indicating their detachment by wood or bone hammer technique. The cores having irregular outline and deep and small flake scars are common. Some flakes are larger in size (118×89×44 mm), but no core in this collection is large enough to yield such flakes. Such cores must have got exhausted by producing further flakes.

Scrapers are the characteristic tools of this industry and the working edges of these are confined on the concave and convex margins. The working in some cases is fine and sometimes bold as well as steep. The collection includes small handaxes which have been trimmed all over by removal of small flakes by employing cylinder hammer technique. Some of the scrapers as well as handaxes show stepped scars along the margins indicating controlled flaking.

## Typology and description of the illustrated tools

The entire collection consisting of 338 tools is from five localities: Nandghat (130) Simga-I (112), Simga-II (35), Somnath (25), Korba (11) and Chandarpur (25). Typologically it could be distinguished as (1) shaped tools and (2) simple artifacts. These two groups have further been divided into several sub-groups on the basis of morphology, overall flaking and the location of secondary work. The detailed classification of each group has been given in Table No. 17.

Shaped tools comprise of choppers, handaxes, scrapers scraper-cum-borers, borers, points and worked blades, whereas simple artifacts include cores flakes, unworked blades, chips, hammerstones and worked nodules.

## Shaped tools

All the sites yielded several shaped tools. The most promising and representative collection comes from Nandghat and all the types except worked blades are found at this site. Scrapers are the most common type and have been found from all the six sites. Then come the points in the order of predominance. The remaining types are also well represented in the collection.

TABLE 17

**Site-wise and type-wise distribution of the Middle Palaeolithic Tools**

| *Tool types* | *Site* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Nandghat* | *Simga I* | *Simga II* | *Somnath* | *Korba* | *Chandarpur* | *Total* | *G. Total* | *Percentage* |
| **Shaped tools (41.12%)** | | | | | | | | | |
| *Handaxe* | 3 | 1 | 1 | — | — | 1 | 6 | 6 | 4.32 |
| Choppers (bifacial) | 5 | 1 | — | — | — | 1 | 7 | 7 | 5 03 |
| *Side-scraper* | | | | | | | | | |
| Concave | 10 | 10 | 1 | 3 | 1 | — | 25 | | |
| Convex | 12 | 7 | 3 | 4 | 1 | 2 | 29 | | |
| Straight | 4 | 4 | 2 | 4 | — | 1 | 15 | | |
| Notched | 4 | 1 | 2 | 1 | — | — | 8 | | |
| *Double scraper* | | | | | | | | | |
| Biconcave | — | 2 | — | — | — | — | 2 | | |
| Concave-Convex | 2 | — | 1 | — | — | — | 3 | | |
| Concave-Straight | — | 1 | — | — | — | — | 1 | | |
| *End-scraper* | 4 | 1 | — | — | — | — | 5 | | |
| *Combined-scraper* | 12 | 1 | — | — | — | — | 13 | | |
| *Core-scraper* | 4 | 1 | 2 | — | — | 1 | 8 | 109 | 78.42 |
| Scraper-Borer | — | 1 | 1 | — | — | — | 2 | 2 | 1.44 |
| Borer | 4 | — | 2 | — | — | — | 6 | 6 | 4.32 |
| *Points on flake* | — | — | — | — | — | — | | | |
| Simple flake | — | 1 | — | — | — | — | 1 | | |
| on blade or flake blade simple | 1 | 1 | — | — | — | — | 2 | | |
| 1 mr. retouched | — | 2 | 1 | — | — | — | 3 | | |
| 2 mr. retouched | 1 | — | — | — | — | — | 1 | 7 | 5.03 |
| Total | 67 | 36 | 16 | 12 | 2 | 6 | | 139 | 100.00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Simple artifacts (58.88%)** | | | | | | | | | |
| *Cores* | | | | | | | | | |
| Flake Core | 3 | 2 | 4 | 2 | 1 | 3 | 15 | | |
| Blade Core | — | 2 | — | — | — | 2 | 4 | | |
| Discoid | — | 1 | 1 | — | — | — | 2 | 21 | 10.55 |
| *Flakes* | | | | | | | | | |
| End flakes | 27 | 20 | 7 | 5 | 3 | 2 | 64 | | |
| Side flake | 6 | 9 | 5 | 3 | 1 | 3 | 27 | | |
| Indeterminate flake | 3 | 1 | — | — | — | — | 4 | 95 | 47.74 |
| *Flake-blades* | 4 | 7 | — | — | 2 | 3 | 16 | 16 | 8.04 |
| *Blades* | 1 | 3 | — | — | — | 1 | 5 | 5 | 2.51 |
| *Chips* | 9 | 20 | — | 1 | 1 | — | 31 | 31 | 15.58 |
| *Worked-nodules* | 10 | 10 | 2 | 2 | 1 | 5 | 30 | 30 | 15.08 |
| Hammer-stone | — | 1 | — | — | — | — | 1 | 1 | 0.50 |
| Total | 63 | 76 | 15 | 13 | 9 | 19 | | 199 | 100.00 |

(*a*) *Choppers*: (7 specimens: 4.32%)

As has been stated previously, choppers form the main tool-type in the Lower Palaeolithic assemblage. Interestingly this group also continues in the Middle Palaeolithic but the tools are of smaller size. These are made on round water-worn pebbles of chert, jasper and quartz and come from four sites namely Nandghat, Simga-I, Simga-II and Chandarpur. The working edge in all the choppers is convex obtained by removal of flakes bidirectionally. Flake scars are generally deep but smaller in size which have been detached only from limited area leaving rest of the pebble surface unworked. On the basis of the working these have been divided in two following sub-groups :

(1) End choppers
(2) Side choppers

*NDG-104*: (Fig. 23.1)

An end chopper fashioned on squarish pebble of yellow chert. The convex working edge has been produced by removal of two deep flakes on one side and a shallow on the other side of the pebble. Slightly rolled and has glazy appearance. (84×79×49 mm).

*NDG-2*. (Fig. 23.2)

An end chopper made on well rounded pebble of jasper which has been flaked bifacially to achieve a sharp and convex chopping edge. The flake-scars are small and deep, covering one third of the pebble, the rest of the pebble portion is left intact. Slightly rolled. (62×57×49 mm).

*NDG-3*: (Fig. 24.3)

An end chopper made on a round pebble of chalcedony. The zigzag edge of the chopper has been formed due to intersection of small and shallow flake scars removed on either side. A portion of chopper is left unworked. Slightly rolled (57×55×43 mm).

*NDG-1* (Fig. 24.4)

A chopper is worked on a pebble of jasper. The convex edge of the tool is along the longer margin which has been formed due to removal of flakes over both the sides. The rest portion is unworked and covered by pebble cortex. Slightly rolled (104×79×68 mm).

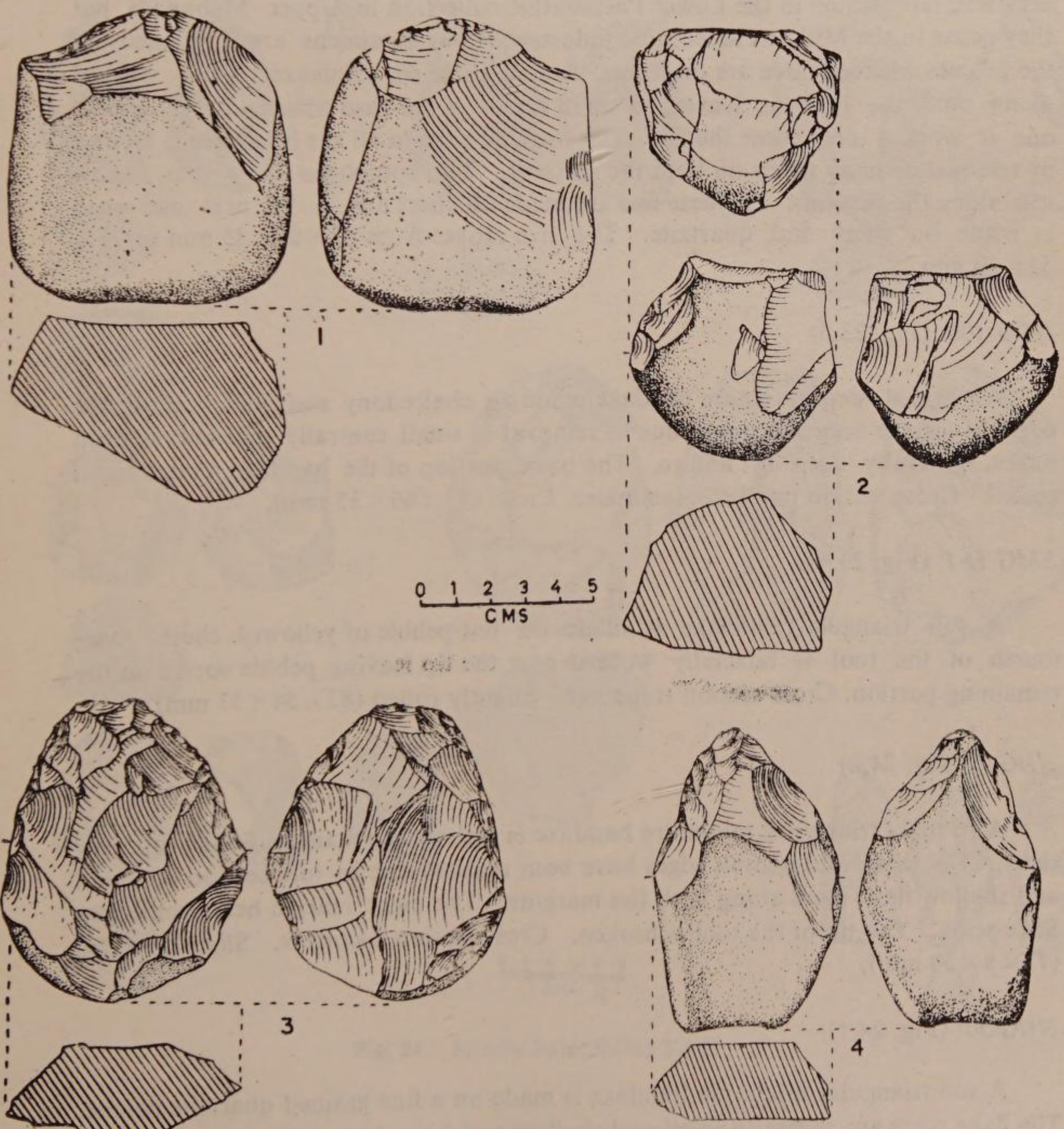



Fig. 23. Middle Palaeolithic tool types

(*b*) *Handaxes* (7 specimens: 5.03%)

Handaxes are the characteristic tools of Acheulian industries. This type is not very well represented in the Lower Palaeolithic collection in Upper Mahanadi but they occur in the Middle Palaeolithic industry. Four specimens are fashioned on the pebbles whereas three are on flakes. Among these six handaxes are fully worked along both the margins leaving a small cortex at the base whereas the remaining one is worked only near the tip. The working edge in all the handaxes is formed by removal of small flakes on both the surfaces. Two specimens carry step flakes-scar along the margins. Of these five are made on chert and in the next one each is made on chert and quartzite. The size ranges from 82×66×35 mm to 73×51×30 mm.

*NDG-106*: (Fig. 23.3)

An oval shaped miniature handaxe made on chalcedony end flake. Both the edges of it have been sharpened due to removal of small centrally directed stepped flakes, generally deep in nature. The basal portion of the handaxe retains small cortex. Cross section parallelogrammatic. Fresh (82×66×35 mm).

*SMG-II-1*: (Fig. 23.4)

A sub triangular handaxe is made on flat-pebble of yellowish chert. One-fourth of the tool is bifacially worked near the tip leaving pebble cortex on the remaining portion. Cross-section trapezoid. Slightly rolled (82×54×33 mm).

*NDG-7*: (Fig. 24.2)

A roughly triangular miniature handaxe is fashioned on an end-flake of grey chert, The sharp and uneven edges have been resulted due to intersection of small and shallow flake scars along both the margins. The right margin bears some step flake-scars. The tip of the tool is broken. Cross section biconvex. Slightly rolled (73×5×30 mm).

*NDG-30*: (Fig. 24.1)

A sub-triangular miniature handaxe is made on a fine grained quartzite pebble. The flake scars are generally small and shallow and have been taken on both the faces. Small patches of cortex are seen on both the surfaces at the base. The tip is pointed and butt is slightly rounded. Cross section. Roughly squarish (73×44×33 mm).

Fig. 24. Middle Palaeolithic Tools

(*c*) *Scrapers*: (109 specimens: 78.42%)

The scrapers are the characteristic tools of Middle Palaeolithic culture and form the major group among the shaped tools. Taking into consideration the working edge situated either on the longer axis or on the shorter or on both longer and shorter sides, these tools have been divided into several sub-groups as under (Fig. 29) :

1. Side scraper
2. Double scraper
3. End scraper
4. Combined scraper
5. Core scraper
6. Scraper-cum-borer.

*Side scrapers*

Among all the varieties of scrapers, side scrapers are the predominant type. In all the cases, the working is confined to one of the longer margins. On the basis of retouching the following four varieties have been distinguished viz. concave (25), convex (29), straight (15) and notched (8). These scrapers are mostly made on flakes whereas there are some pieces which are worked on nodules (17 pieces). The working is common on the ventral surface but dorsal surface also possesses the retouching on some of the scrapers. A few nodules in the collection show steep working. The size of the scrapers in this group ranges from 121×71×28 mm to 24×17×8 mm.

*SMG-II-10*: (Fig. 25.1)

A concave side scraper is made on an end flake of chalcedony. The dorsal surface of the flake bears longer flake scars and retouching along the left lateral margin. On the ventral side is a primary flake surface with a prominent bulb of percussion. The striking platform is plain. Rolled (61×45×19 mm).

*SMG-I-23*: (Fig. 26.4)

It is a concave side scraper fashioned on a quartzite flake-blade. The dorsal surface retains some flake-scars and a patch of cortex at the distal end. A few shallow scars are also seen on the ventral surface. Fresh (80×45×20 mm).

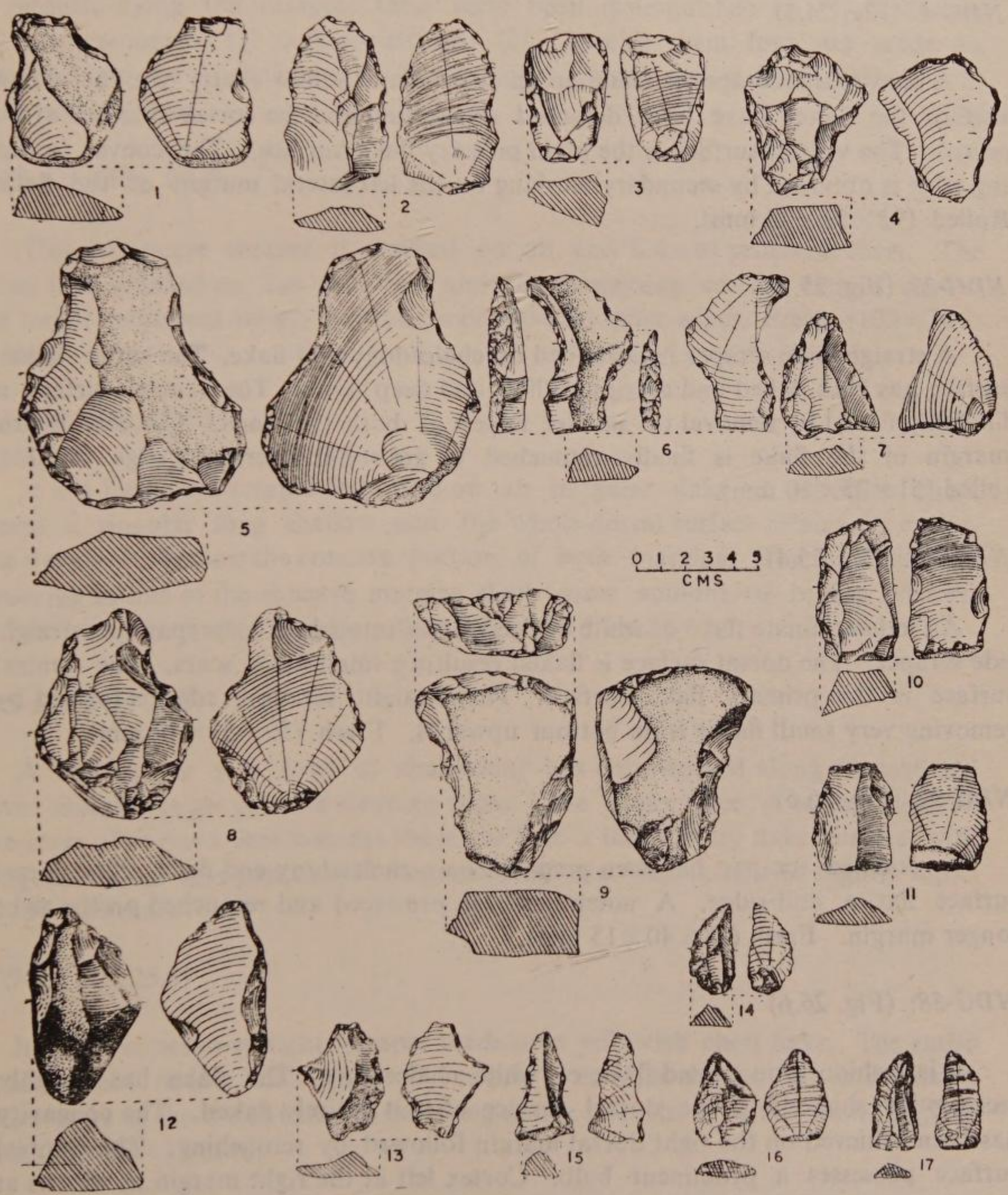



Fig. 25. Middle Palaeolithic Tools

*SMG-II-18*: (Fig. 25.2)

It is a convex side scraper prepared on greenish chalcedony flake blade. The upper surface carries shallow flake scars whereas the under surface is plain. It has a faceted platform and defused bulb of percussions. Fresh. (68×40×13 mm).

*NDG-47* (Fig. 24.3)

A convex side scraper is made on an end flake of yellow chert. On the dorsal surface the flakes have been detached all around and the cortex retained at the centre. The ventral surface is the plain primary flake surface. The convex scraping edge is obtained by secondary working on the left lateral margin of the flake. Rolled (92×52×24 mm).

*NDG-20*: (Fig. 25.3)

A straight side scraper is fashioned on chalcedony end flake. The entire dorsal surface has been flaked and carries shallow and deep scars. The ventral surface is limitedly flaked by removal of smaller flakes at both the ends. The left lateral margin of the flake is finally retouched to get suitable scraping edge. Slightly rolled (51×25×20 mm).

*NDG-33*: (Fig. 25.4)

An indeterminate flake of white chalcedony is retouched to prepare a straight side scraper. The dorsal surface is flaked resulting small flake scars. The ventral surface is the primary flake surface. The straight scraping edge is formed by removing very small flakes from bottom upwards. Fresh (59×51×19 mm).

*NDG-22*: (Fig. 26.5)

A notched scraper has been prepared on a chalcedony end flake. The dorsal surface has a mid-ridge. A notch has been produced and retouched on the right longer margin. Fresh (58×40×15 mm).

*NDG-58*: (Fig. 26.6)

It is fashioned on an end flake of white chalcedony. The flake has roughly rectangular shape and the dorsal surface of it is entirely flaked. The concavity has been achieved on the right dorsal margin followed by retouching. The ventral surface possesses a prominent bulb. Cortex left at the right margin as well as at the platform. Fresh (45×44×15 mm).

***Double scrapers*** (6 specimens)

All the scrapers of this group are fashioned on the flakes. In this group generally two edges of the flakes are worked from bottom upwards. On the baiss

of retouch along the margins these have been distinguished as (1) Biconcave (2) concavo-convex (3) concavo-straight (2). Among them four are made on chert and two are on chalcedony. The size of this group ranges from 103×74×26 to 36×30×12 mm.

*NDG-121*: (Fig. 25.5)

This biconcave scraper is worked on an end flake of yellowish chert. The dorsal face is flaked on the left half and the remaining surface retains cortex. The tool is retouched steeply to produce concave scraping edges. Fresh (103×74×26 mm).

*SMG-10*: (Fig. 25.6)

It is a biconcave scraper fashioned on an irregular flake of yellowish chert. Except a singular long shallow scar the whole dorsal surface retains the cortex. It is steeply worked on the concave portion of both margins. The tool suggests reworking as one of the concave margins show some amount of rolling whereas the other is quite fresh. Slightly rolled. (65×30×14 mm).

*NDG-59*: (Fig. 25.7)

A rectangular side flake of chalcedony has been worked along concave and convex margins to get suitable scraping edges. The upper face possesses shallow flake scars of various sizes whereas the under face is the primary flake surface with triangular bulbar scar just near the worked platform. Patinated and slightly rolled (49×38×59 mm).

*SMG-3*: (Fig. 25.8)

It is a concavo-straight scraper made on a yellowish chert flake. The entire dorsal surface retains flake-scars of various sizes while the ventral surface has a shallow scars at the distal end and battering marks over the proximal end. Slightly rolled. (83×62×18 mm).

***End scrapers*** (5 speeimens)

This group consists of the specimens worked at the end of the shorter axis of the flakes as well as on nodules. The retouch in all the cases is very steep and is confined to the convex portion. In the collection three specimens are made on chert and the remaining two are on chalcedony.

*SMG-3* : (Fig. 25.9)

A green chert nodule has been worked along the shorter axis to get a suitable scraping edge. A few irregular thin flakes have been removed from both the longer margins while rest of the portion carries cortex. Fresh (85×64×29 mm).

*Combined scrapers* (13 specimens)

Out of the thirteen specimens twelve come from Nandghat and one from Simga. These are worked on both the longer as well as the shorter margins which form an angle at their meeting point. All the tools of this group are made on flakes and have generally been retouched by taking out flakes from the ventral towards the dorsal side. All of them carry sharp working edges which are sometimes steep. The raw material used for this group is chert (7), chalcedony (5), and Quartzite (1).

*NDG-37*: (Fig. 25.10)

A combined scraper is prepared on brown chert flake by retouching along the proximal end and left lateral side to form combined scraping edge. Sub triangular and several small flakes have been detached over the dorsal surface whereas the ventral surface shows some small flake scars along both the sides. Fresh (60×36×17 mm).

*NDG-103*: (Fig. 25.11)

An end flake of white chalcedony has been properly worked along the convex longer and straight shorter axis for preparing a combined scraper. The dorsal surfaces has a mid ridge. The ventral surface is plain primary flake surface. A small patch of cortex is seen at the platform. Fresh (46×32×19 mm).

*KRB-2*: (Fig. 25.12)

It is a combined scraper fashioned on a quartzite nodule. The dorsal surface carries a few flake-scars while opposite side is primary flake surface. It is retouched along left dorsal margin and on the pointed end. The tool could have also served as nosed scraper. Fresh (78×40×27 mm).

*Core-scrapers* (8 specimens)

All the examples of this group are fashioned on cores which were used for sriking off desired flakes and blades. All these specimens are further flaked and

sometimes retouched due to which the edges have become effective. These could have served as core-scrapers. Four specimens in this collection are made on chert, three on chalcedony and a solitary specimen is on jasper. Among these 6 are made on flake-cores and one each on blade and discoidal cores. The size of core scrapers range from 70×56×34 to 32×30×16 mm.

*NDG-5* : (Fig. 24.5)

A nodule of yellowish chert has been flaked all around from the base upwards and retains a small patch of cortex at the top. At one place on the periphery, several blades have been removed to get a sharp edge converting it into a core scraper. Fresh 59×51×34 mm.

*NDG-66* : (Fig. 24.4)

It is a core scraper made on a white chert nodule. The tool carries flake-scars both shallow and deep in nature all over and sharp edges along the margins. Slightly rolled (70×30×23 mm).

*Scraper-cum-borer* (2 specimens)

Both the specimens of this group are fashioned on indeterminate flakes. These are retouched along concave and convex margins and also possess boring tips which have been produced by the removal of two deep notches followed by retouching such specimens must have been used as scrapers-cum-borers.

*SMG-II-28* (Fig. 25.13)

An indeterminate flake of chalcedony has been worked to fashion as a combined tool. Its convex margin of it has been properly retouched and opposite to the scraping edge a borer tip has been obtained by producing small notches. This tool could have served both the purposes. Slightly rolled (46×35×10 mm).

*Borers* (6 specimens 1.44%)

All the specimens of this group are made on flakes, two each on the side-and end-flakes the rest are on indeterminate flakes. They have been retouched on both the sides below the tips due to which effective boring tips have been obtained. Five specimens of this group are made on chalcedony whereas a single one is on chert material.

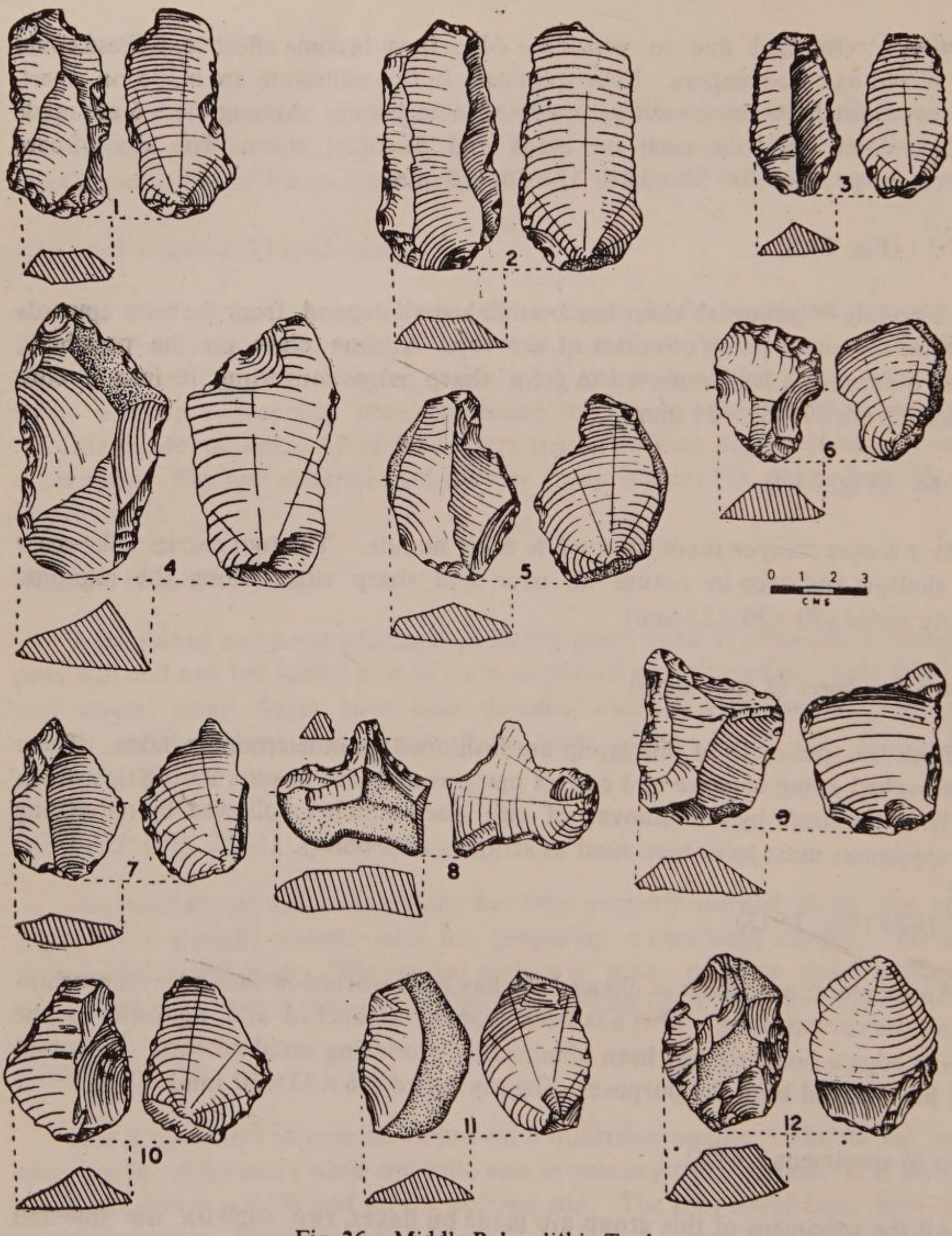



Fig. 26. Middle Palaeolithic Tools

*NDG-57* : (Fig. 26.7)

An end-flake of white chalcedony possesses two small notches and retouched along both of the margins at the proximal end. The dorsal surface of the tool has

got a medial ridge whereas other surfaces is a primary flake surface. Fresh (48×33×12 mm).

*NDG-15* : (Fig. 26.8)

A side flake of chalcedony has been turned into borer after producing two deep notches and proper retouching. The dorsal surface carries cortex whereas the ventral surface is a plain flake surface with a prominent bulb of percussion. Fresh (45×46×14 mm).

*NDG-17* : (Fig. 26.9)

This borer is made on an indeterminate flake of chalcedony. It has been retouched along two longer axes and a borer tip has been formed at the meeting point. The upper surface carries a few deep and shallow flake scars while the under surface is plain. Patinated and slightly rolled. (56×46×14 mm).

*Points* (7 specimens : 5.03%)

All the examples are made either on flakes or on flake-blades and blades. The points made on flakes are less (only 2 specimens) whereas those on flake-blades and blades are dominant (6 specimens). On the basis of retouch this group has been divided in three sub-groups.

(i) Simple points
(ii) Points with single marginal retouch
(iii) Points with both margins retouched

Simple points are those which lack any type of secondary work but have pointed forms and utilization marks whereas other types of points have been retouched on either one margin or on both. In this collection 5 points are fashioned on chert, 2 are on chalcedony, and one is on quartz.

I. *SMG-65* : (Fig. 25.14)

A pointed flake-blade of yellowish chert carries utilization marks along the right lateral margin. The dorsal surface retains some small parallel scars and a little cortex whereas the ventral surface has a prominent bulb of percussion. Fresh (38×18×0.9 mm).

*NDG-23* : (Fig. 25.15)

A triangular flake-blade on yellowish chert has medial ridge in the centre and a small patch of cortex at the base. Both the margins of the tool show the removal of some tiny flakes producing an incipient tang. Slightly rolled (45×25×12 mm),

II. *KRB-9* : (Fig. 25.16)

This end-flake of quartz tappers to a point and has been retouched along the left lateral margin. The tool looks like a leaf-shaped and carries several flake scars on the upper side. At the opposite side it has a plain primary flake surface. Slightly rolled (37×24×0.3 mm).

III. *NDG-103* : (25.17)

A flake-blade on chalcedony has been retouched on both the margins. The dorsal surface carries several blade like scars and a prominent bulb of percussion and a small bulbar scar on the ventral side. Fresh (42×20×0.8 mm).

*Worked blades* : (2 specimens : 1.44%)

This group is very small and blades of this group bear working along one of its margins.

*SMG-I-53*

It is a chalcedony blade worked on one margin. The opposite margin bears some irregular scars, the blade surface retains some flake scars over the dorsal surface while ventral surface is plain. The blade has prepared platform. Slightly rolled (62×28×9 mm).

*NDG-35*

A chalcedony blade has been retouched along one of the dorsal surface has a mid ridge and a small cortex at the distal end. Fresh (50×20×10 mm).

**Simple Artifacts**

Simple artifacts form the major group and are greater in number than the shaped tools. These are found at all the sites. The number of tools is 199 (58.88%). This group includes cores (21 : 6.21%), flakes (95 : 28.11%), flake-blades (16 : 4.73%), blades (5 : 1.48%) chips (31 : 9.17%), hammerstones (1 : 0.30%) and worked nodules (30 : 8.88%).

(*a*) *Cores* : (21 specimens : 6.21%)

Cores have been found at all the sites. Generally suitable rock pieces and pebbles have been selected for striking off the desired flakes, flake-blades and blades.

These cores sometimes bear scars all over and sometimes they are partly flakes the remaining portion of which retains cortex. Taking into consideration the nature of flaking and flake-scars these have been divided in three sub groups :

(1) Flake cores
(2) Blade cores and
(3) Discoidal cores.

*SMG-57* : (Fig. 27.1)

The core has a roughly round outline and is on yellowish chert. It is flaked all over by removal of smaller flakes and retains a small area of cortex at two places on its body. Fresh (58 × 52 × 47 mm).

*CDR-2* : (Fig. 27.2)

A chocolate brown coloured chert piece has been selected for striking off the flakes of various sizes. Generally the flakes out of this core have been detached from the periphery towards the centre as it is evidenced by the centrally directed flake scars. A small cortex is also seen over it. Fresh (68 × 61 × 47 mm)

*CDR-9* : (Fig. 27.4)

It is a blade core on a chocolate brown chert pebble of small size. Several parallel sided blades have been struck off multi-directionally leaving half of the portion intact as cortex. Fresh (33 × 30 × 25 mm).

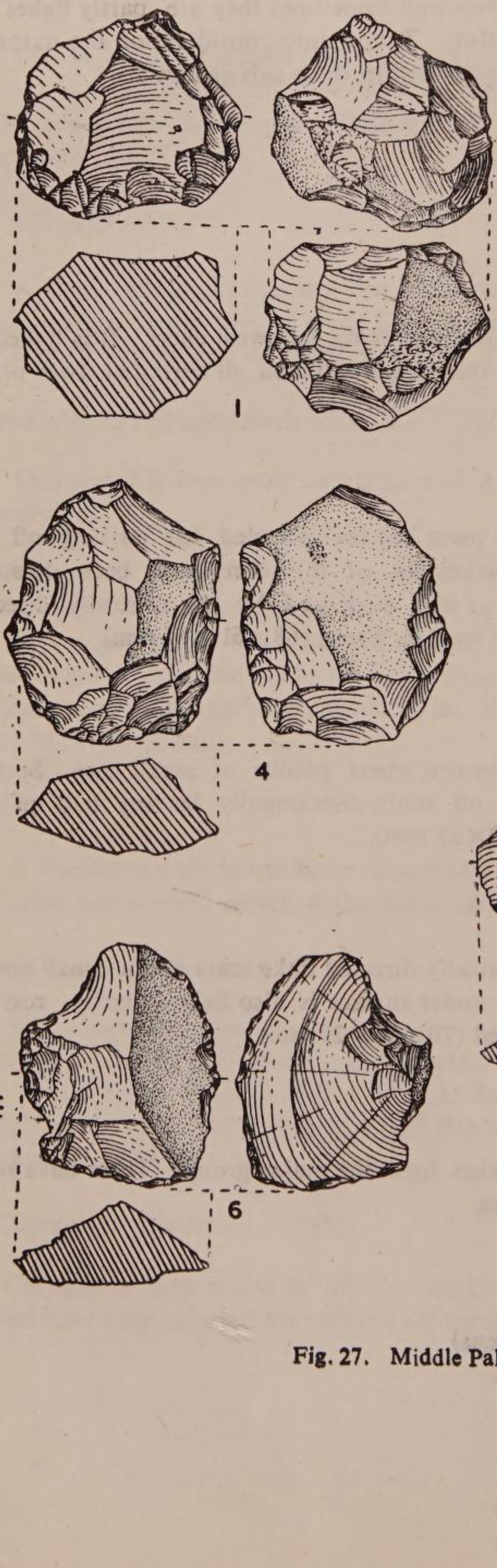
*SMG-II-3* : (Fig. 27.3)

A yellowish chert nodule bears centrally directed flake scars and a small cortex at the centre of the upper surface. The under surface is also flaked partly, rest of the portion retains cortex. Slightly rolled (70 × 56 × 27 mm).

(*b*) *Flakes* (95 specimens : 28.11%)

Among the simple artifacts, the flakes form the major group. These have been represented by following three sub-types.

(1) End-flakes (64 specimens)
(2) Side-flakes (27 specimens)
(3) Indeterminate flakes (4 specimens)



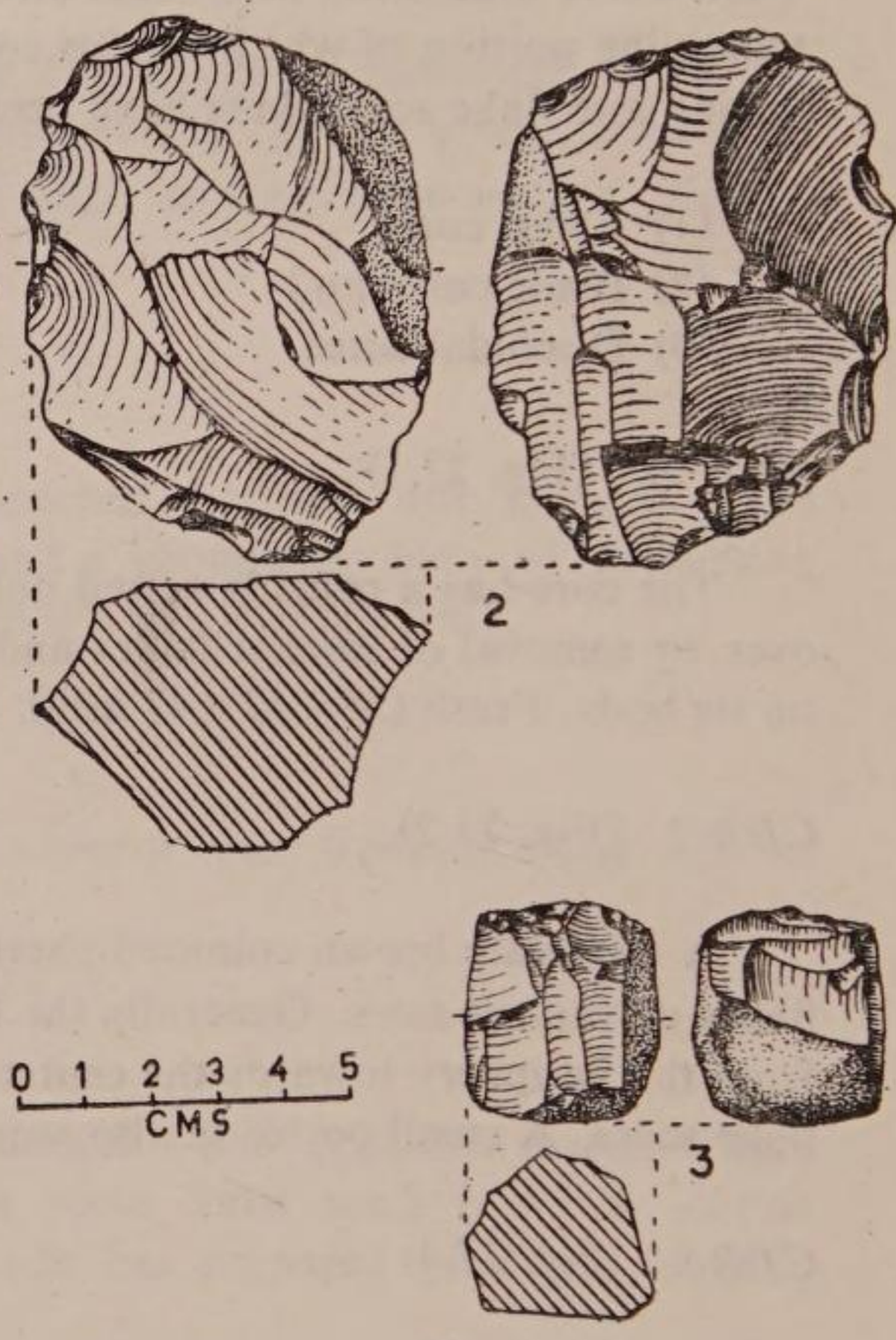



**Fig. 27. Middle Palaeolithic Tools**

Most of the flakes bear scars of various sizes, plain striking platforms and prominent bulbs of percussions. But there are some flakes which have got flake scars over part of dorsal surface leaving rest of the portion as cortex. In some of the cores the cortex is also seen over the platforms. A few flakes are there which carry defused bulbs of percussions. Some flakes in this collection have got prepared platforms and regular centrally directed scars. The measurements of the end-flakes vary from 118×89×41 to 28×20×7 mm, while side-flakes from 52×67×10 to 28×44×11 mm. There are some flakes which have battered edges.

*SMG-57* : (Fig. 26.10)

It is an end flake of chalcedony. The dorsal surface possesses only a few flake-scars while the ventral has a prominent bulb. The flake has plain platform and utilization marks along the margins. Fresh (58×37×8 mm).

*NDG-77* : (Fig. 26.11)

It is on chalcedony, the upper surface of which carries single flake scar and cortex whereas under surface has prominent bulb of percussion and a small bulbar scar at the proximal end and a tiny triangular flake scar at the distal end. The striking platform is plain. The flake carries utilization marks along one of the margins. Fresh (50×23×11 mm).

*NDG-28* : (Fig. 26.12)

It is an end-flake of white chalcedony. The dorsal surface bears centrally directed flake scars and a small cortex at the centre. The ventral surface shows prominent bulbs of percussion and removal of two small flakes at the distal end. It also has battered edges. Fresh but patinated (55×39×20 mm).

*NDG-100* : (Fig. 27.5)

The quartzite side flake possesses three larger flake scars on the upper surface while the under surface is plain. The platform is worked and the bulb is chipped off. Fresh (43×61×14 mm).

*SMG-100* : (Fig. 27.6)

It is a side-flake of yellowish chert of which half of the dorsal surface is flaked by the removal of several small flakes, shallow and deep in nature and remaining half carries the cortex. The ventral surface also possesses some small flake scars at the distal end. The utilization marks can be seen on the edges of the flake. Fresh (52×67×18 mm).

*NDG-67* (Fig. 27.7)

It is an indeterminate on chalcedony, both the surfaces of which carry irregular flake scars. The bulb and platforms are not clear. Slightly rolled. (40 × 35 × 13 mm).

(c) *Flake-blades* (16 specimens 4.73%)

These have blade like forms but are not true blades. Thirteen pieces are made on chert, two on chalcedony, and the remaining one is on quartz material. The size of this group falls within 64 × 36 × 15 mm and 33 × 18 × 26 mm.

(d) *Blades* (5 specimens : 1.48%)

These are found only at Nandghat, Simga, and Chandarpur. Four of these are made on chalcedony and the rest are on chert. Three blades of this group possess some irregular fracture thereby suggesting their utilization.

*NDG-75* : (Fig. 26.2)

A blade on chalcedony has two ridges on its dorsal surface and a prominent bulb of percussion on the ventral. The platform is plain and has utilization marks along both the margins. Fresh (75 × 37 × 13 mm). The collection also contains some specimens which can be categorised as chips (31 : 9.17%), worked nodules (30 : 8.88%) and hammerstones (1 : 0.30%).

## DISCUSSION

This industry is dominated by flake tools although the pebble tools are not altogether absent. The scrapers are the leading types followed by borers and points. These types are also common at other Middle Palaeolithic sites of the sub-continent But the interesting feature of Mahanadi industry is the occurrence of pebble tools and small handaxes. The latter tools are generally smaller in size and are made on chert jasper and chalcedony material unlike the Lower Palaeolithic industry which is on dolerite and quartzite. The pebble tools and handaxes indicate continuation of the Acheulian tradition in the Middle Palaeolithic culture.

The characteristics of the Middle Palaeolithic culture of Mahanadi valley are detailed above. An attempt is now made to understand its resemblance with other similar cultures from regions all over India. Firstly the sites occurring in the neighbouring areas are considered and later those of more distant areas have been dealt with.

Such occurrences have also been noticed in other parts of India as Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Andhra Pradesh and Karnataka. The presence of handaxes in the Middle Palaeolithic industries was brought to light as early as 1956 by Prof. Sankalia (1956 : 35-53) at Nevasa, Ahmednagar. Joshi (1966: 226-280) also confirmed this when he took up an extensive study of Wainganga valley in Madhya Pradesh and Maharashtra and discovered several stratified localities. He recognised two sets of industries in two different stratigraphical horizons and designated them as Wainganga-A, Wainganga-B. On the stratigraphical, technological and typological basis Allchin and others (1978 : 96) feel that 'Middle Palaeolithic industries are continuation of Acheulian tradition'.

The Middle Palaeolithic industries are widely distributed in different parts of the Indian sub-continent. They are mostly fashioned on cryptocrystaline silica group minerals but the tools at the sites like Bhimbetka (Misra 1972 : 10-16), Adamgarh (Joshi 1978 : 198-200), Rallakalava valley (Murty 1966 : 109-110) in Andhra Pradesh, are manufactured on quartzite, while at Kalubhar valley in Saurashtra the raw material is the Deccan trap. The Narmada shows use of two different types of raw materials : quartzite (Supekar 1968 : 81) as well as cryptcrystalline silica family minerals (Joshi *et al* 1978 : 168-181).

Middle Palaeolithic industries generally succeed the Lower Palaeolithic in Peninsular. India and the stratigraphical position of them is now very clear after the excavation of some of the important primary sites like Bhimbetka and Adamgarh. In the major rivers like Narmada and Godavari they are associated with the sandy pebbly or pebbly gravels overlying the bouldery gravels containing Lower Palaeolithic tools. However at some localities the situation appears rather confusing where (Mahadeo Piparia) both the Lower Palaeolithic and Middle Palaeolithic industries occur in the same deposit. It may be argued that such deposits may not be primary but the tools of two different industries got mixed up during redeposition. It is quite likely that the advanced cultures belonging to Lower Palaeolithic might have co-existed along with those of Middle Palaeolithic.

An industry yielding Middle Palaeolithic tools has been found from the loose gravel of Dhasan river near Sihora, Mohasa and Semraghat in the Sagar district of M.P. (Singh 1965 : 110-115). All the finished tools such as handaxes, scrapers, points, awls and awls-cum-scrapers have been found at this site which are very similar to the types from the upper Mahanadi valley. However the cleaver which is represented by one piece in Sagar area has not been encountered in our industry. Among the simple artifacts, faceted flakes showing the characters of the levalloision flakes have been found in sufficient quantity in this industry while in the upper Mahanadi only a few pieces could be noticed. The handaxes (19 against 321 tools)

and solitary cleaver on the Dhasan are fashioned on the granite, whereas other tool types have been made on the chert. On the basis of the differences in the raw material Singh (1965 : 115) prefers to call it the 'Late Palaeolithic'. In the upper Mahanadi the majority of the tools, including handaxes, have been fashioned on the silica family minerals. Thus the Dhasan industry shows many points of agreement with those of our region.

In the Damoh area of M.P. (Joshi 1961 : 20-33) two gravel formations have been noticed. The basal boulder Conglomerate of the Damoh area has not yielded the Acheulian tools but in the neighbouring Narmada the Acheulian industry comes from this horizon. The Middle Palaeolithic industry of the area occurs in comparatively loose pebbly gravel and in this respect it is similar horizon for Narmada Middle Palaeolithic industry. The handaxes and choppers which are present in our collection are absent in the Damoh area. According to the writer "Damoh industry exhibits the Acheulian characters". Both the industries are made on silicious family minerals. The Damoh Middle Palaeolithic industry is therefore comparable with the Middle Palaeolithic industry of the upper Mahanadi valley.

The Narmada (Supekar 1968 : 194-326) which is regarded as the nuclear region for the Quaternary and prehistoric studies lies not far from the Mahanadi. It yields Middle Palaeolithic industry from the second group of pebbly gravel. This horizon overlies the Boulder Conglomerate yielding an Acheulian industry but at the same time in the excavations at Mahadeo Piparia on the Narmada (Supekar 1968 : 134-193) the Middle Palaeolithic tools have been found mixed with the Lower Palaeolithic tools. All the tool types including handaxes and the late Pleistocene fossils have been found in this area. The tools here are made on chert and quartzite while, the majority are on crypto-crystalline silica in the upper Mahanadi valley. The Boulder Conglomerate yielding Acheulian tools could not be traced anywhere in the upper Mahanadi valley.

In the vicinity of the Narmada at Adamgarh rock shelters near Hoshangabad a Middle Palaeolithic industry has been encountered in the stratigraphical context underlain by lower Palaeolithic and overlain by Mesolithic deposit and shows difference in typology from both of these industries (Joshi 1978 : 34). The tool types include handaxes, scrapers, borers, and points. However, no cleaver could be traced here as also in the case of the upper Mahanadi valley. The tools are generally fashioned on the flakes as well as nodules of quartzite while a few are on chert. Tools made on chalcedony were altogether absent. Most of tools are unifacially worked while a few scrapers have been worked bifacially. The tools are made on flakes but more often on the flake-blades. The presence of blades in Adamgarh Middle Palaeolithic industry is significant (including a few baked blades). Similarly

a few blades made on chert and chalcedony have also been found from the upper Mahanadi valley. This industry on the one hand shows Late Acheulian characters while on the other it has similarity with the Wainganga B industry (Joshi 1978 : 34-39).

The site of Bhimbetka lying not far from the Narmada river has recently been excavated. The details of this industry have not so far been published (Misra 1978 : 14). Technologically and stratigraphically the Middle Palaeolithic of Bhimbetka is different from Acheulian industry made on quartzite.

At the other sites like Pandav Falls Kanhari fields and Baghain river gravels (Allchin 1959 : 1-36) some Middle Palaeolithic industries have been reported. Though the detailed typological classification has not been published, the tool types like scrapers points, choppers (bifacial) and a single handaxe are mentioned. On the typological basis this industry finds comparison with the Mahanadi industry but the borers which are found in our collection do not appear here. Regarding raw material the industry under discussion presents different picture. Here the tools are made on limestone and a few are on fine grained quartzite which are weathered, whereas the upper Mahanadi industry is fashioned mainly on silicious material.

In the Wainganga valley in M.P. (Joshi 1966 : 276-280) the lower gravel yields Middle Palaeolithic tools (Wainganga-A) and the overlying gravel contains tools of the Upper Palaeolithic (Wainganga-B). The Wainganga industries have close similarity with those of the upper Mahanadi. The stratigraphical horizon of the Lower Palaeolithic is absent on both the river valleys. In the Mahanadi the gravel lying at the base yields Middle Palaeolithic industry and succeeding gravel reveals the Upper Palaeolithic industry. The raw material used in both the areas is silica family minerals. The tool types found in the 'Wainganga-A' industry also occur in the upper Mahanadi assemblage showing late Acheulian characteristics.

In the Tapti basin several Middle Palaeolithic sites have been discovered (Joshi and Sali 1968-69 : 818-827). These are the factory sites and yield interesting tools such as choppers, handaxes, scrapers, borers and points made on chocolate brown coloured basalt. Techno-typologically this industry is comparable with that of the Mahanadi valley.

The Berach basin in Rajasthan (Misra 1967 : 73-98) has also yielded a Middle Palaeolithic industry in the stratigraphical context *in situ* as well as from the pebbly gravel. It is dominantly fashioned on chert while quartzite has also been utilized in sufficient quantity. The tools represented are handaxes, cleavers, various types of scrapers, scraper-cum-borers, borers, points and knives. In contrast with

this no cleavers and knives are present in the upper Mahanadi valley. The levalloision flakes which are significant in the Berach industry, are very few in our industry. The presence of handaxes and cleavers in the Berach basin indicates the advanced Acheulian tradition in the Middle Palaeolithic culture.

Several Middle Palaeolithic sites are located in Gujarat on the Mohar river, (Soundara Rajan 1960 : 166-179), various streams in northern and southern Kutch (Ansari and Pappu 1970 : 159-164), and Kalubhar valley (Chakrabarti 1977 : 159-221). The detailed typological distribution about the first two areas are not available. In the Kalubhar valley the main tool types are various types of scrapers, borers, points and knives. Some handaxes (4 : 1.53) and choppers (8 : 3.10) representing Acheulian tradition also occur in the present collection and are generally found on the exposed gravel and on the surface. Technotypologically this industry has got similarity with those of our region but some of the tool types such as the knife are absent in the upper Mahanadi valley. Regarding the distribution of raw material the sites of the Dhrud river in southern and northern Kutch show the use of quartzite and silicious group minerals while in the Kalubhar valley they are made exclusively on trap.

In Maharashtra, the important Middle Palaeolithic sites are known from the Pravara and Godavari river valleys (Banerjee 1957 : 135-143; Joshi *et al* 1981 : 47-64) and have been found from the present river gravels as well as in the high level gravels. The tool types such as scrapers, borers, scraper-cum-borers and points made on chert and allied minerals occur in this region. The Wadoli and Wagholi industries on the Godavari show late Acheulian workmanship and has been compared with the Wainganga-A industry. Taking into consideration the techno-typological features these industries are also comparable to the Mahanadi industry. However, the tool types such as handaxes and choppers were not encountered in the Godavari assemblages.

In Karnataka, better known sites are Taminhal (Banerjee 1957 : 255-288), Kovalli and Anangwadi (Pappu 1974 : 85-115), some sites in the Middle Krishna (Korisettar 1979 : 91-123), and Hunsgi valley (Paddayya 1968 : 23-69). All these sites have yielded tools of Middle Palaeolithic culture such as scrapers, borers, point and occasionally scraper-cum-borers, and scraper-cum-points generally fashioned on siliceous minerals. They mostly come from river gravels, high level gravels and the surface. However, the percentage of borers at Taminhal is unusually high and goes as high as 47.8% while scrapers are represented only by 39.5%. In contrast with this, the other sites of Karnataka show the dominance of scrapers and the borers are much less. Another typological difference is seen in the sites of the Middle Krishna valley. Here advanced Acheulian forms like handaxes and choppers

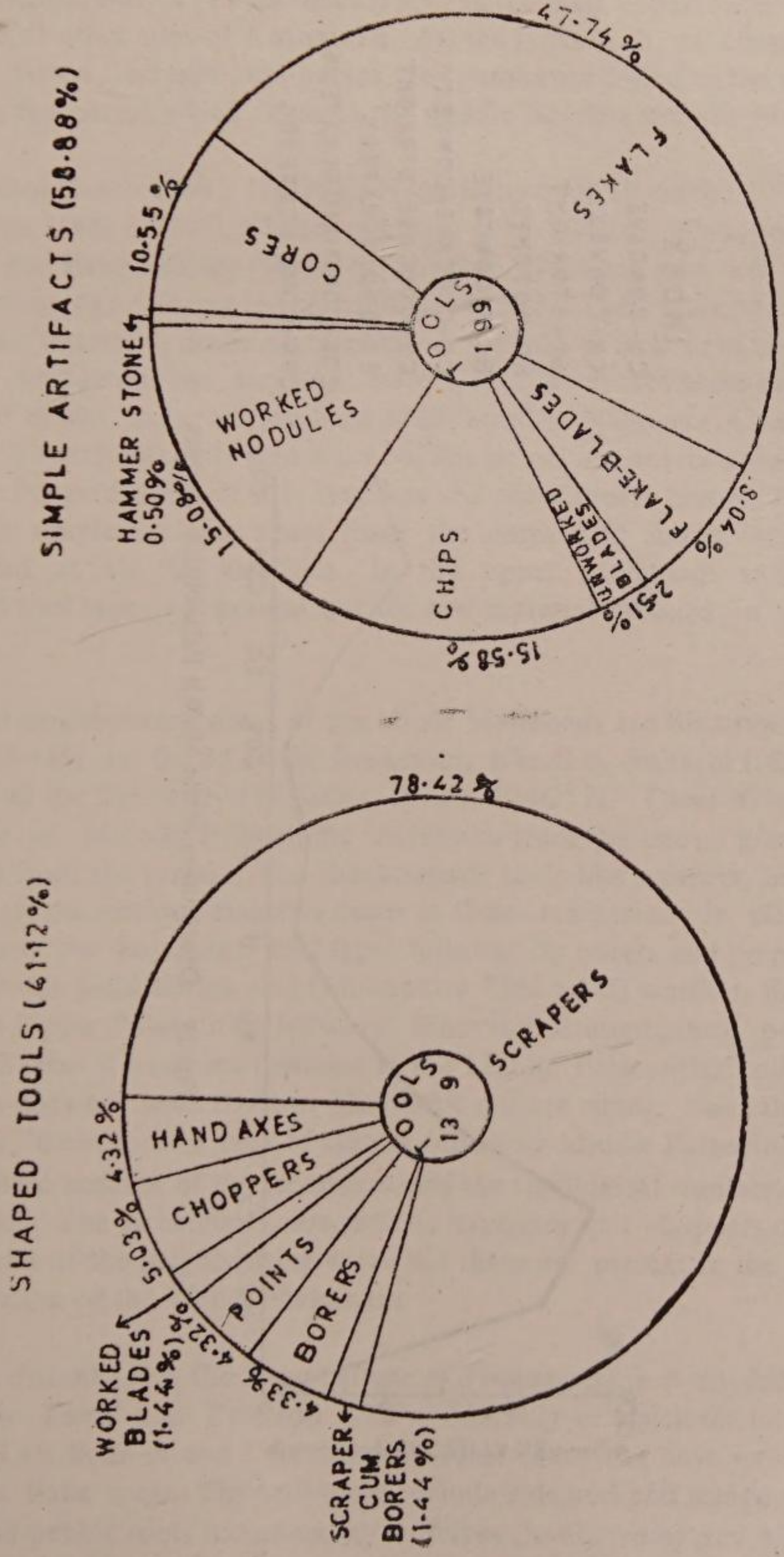



Fig. 28. Middle Palaeolithic Tool Types

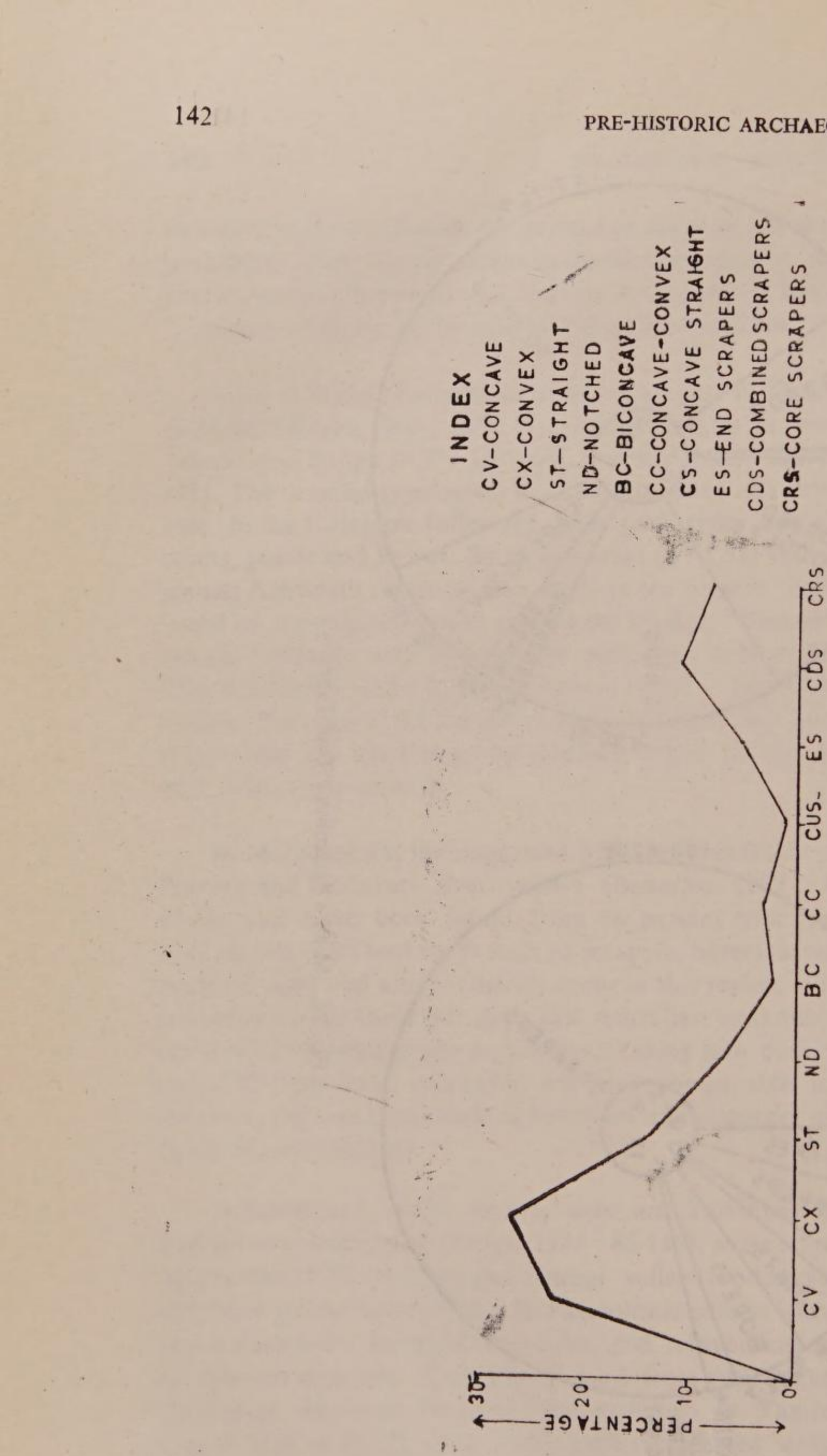



Fig. 29. Distribution of the Middle Palaeolithic Scrapers

are represented. Burins (10 specimens) also make their appearance. These tool types are absent at other sites of Karnataka. All the types such as choppers, handaxes, scrapers, borers, scraper-cum-borers and points are found in the upper Mahanadi valley but the burins which occur in the middle Krishna are absent in our industry.

Kurnool (Isaac 1960 : 176-304), Nagarjunakonda (Banerjee 1975 : 42-45), Nalgonda (Rao 1966: 82-143), Chittoor (Murty 1966: 107-169). Cudappah (Reddy 1968: 127-171), and Paleru valley (Madhusudan Rao 1980) are very well known regions for the stone age cultures in the Andhra Pradesh. These sites have yielded Middle Palaeolithic industries made on quartzite which has as well been utilized in earlier cultures. Alongwith the scrapers, borers and points the tools like handaxes and cleavers of earlier tool tradition have been found in Nalgonda, Chittoor and Paleru valley, At Nagarjunakonda and Kurnool the points are nearly upto 50% while at other sites the percentage of it is very less and the scrapers become the major group. Among the simple artifacts, apart from the cores and flakes, blades have been encountered at all the localities. In the upper Mahanadi valley all the above mentioned tool types are present but the raw material utilized in our industry is different.

In the neighbouring areas of the upper Mahanadi are the upper Son (Ahmed : 1966 : 107-138) in the M.P. the Brahmani, Khadkei, Baitarni (Mohapatra 1962 : 93-120); and the Tel valley (Tripathy 1972 : 124-217). These river valleys show occurrence of Middle Palaeolithic industries from the second gravel (pebbly) and sometimes from the surface. The characteristic tools like scrapers, borers and points made mainly on silicious minerals occur in these industries. In all the areas the scrapers are the dominant tool types followed by borers and points. Some of the areas of Orissa yield burins also (Mohapatra 1962 : 113) which is the characteristic tool of the Upper Palaeolithic industry. Since the stratigraphical position of such tools is not clear it has been included in the Middle Palaeolithic collection, as typologically it does not seem to fit in Mesolithic culture either. Sankalia (1974 : 178) thinks that "these form a part of culture following Middle Palaeolithic and preceding Mesolithic because of the technique and the typological similarities to the upper Palaeolithic". The Acheulian tools such as handaxes and choppers do not occur in the industries of the neighbouring areas but these are present in the Middle Palaeolithic collection of the Upper Mahanadi.

In the distant areas the Soan culture of Potwar region is divided in four subgroups (De Terra and Paterson 1939 : 308-312) of which the late Soan is again divided in Late Soan-A and Late Soan-B. These industries have yielded core tools as well as flake tools. The tool types include side and end scrapers, small points, notched and pebble tools including cores, flakes (levalloision) and blades.

The excavation in Sanghao cave, Pakistan (Dani 1964 : 1-50) yielded Middle Palaeolithic industry. The detailed typological distribution has been published but the major tool types mentioned by Dani are several types of scrapers, points and a few burins and one handaxe. Thus these industries of Indian sub-continent possess some points of similarity with the peninsular industries.

Outside India is the Middle Stone Age phase of Africa the Acheulian large cutting tool tradition is found in a modified form. Besides handaxes and cleavers which are now often of quite small proportions, there are varieties of scrapers made on flakes, levalloision flakes and flake-blades. Certain heavy duty equipments notably steep scraping forms have also been found. In some regions as in the Kango, Lake Victoria and Lake Tanganyika basin a new form of tool now makes its first appearance. This is long laneeolate point of stone worked over on both the surfaces (Clark 1970 : 107-117).

While comparing the African Middle Stone Age industries with those of Indian Middle Palaeolithic industries it is evident that all the important tool types like miniature handaxes and cleavers, varieties of scrapers (including steep retouched scraper or push-plane) and points also occur in Middle Palaeolithic industries of India. However the bifacial points (lanceolote points) worked so regularly on both the surfaces are rare or absent in Indian collections. These differences are indeed bound to be there in two different geographic regions. When Prof. J.D. Clark was recently in India and examined the Middle Palaeolithic collections from different regions including Mahanadi area housed in the Deccan College Researh Institute, expressed that technologically the Middle Palaeolithic industries of India have got several points of similarities with the Middle Stone Age industries of Africa.

The overwhelming majority of the dates of the African Middle Stone Age cultures fall between 60000-35000 years B.P. i.e. in upper Pleistocene (Clark 1970 : 107-150 and Klien 1970 : 128). These dates are further supported by the varieties of animal remains which they contain. Sometimes a few sites have shown a very early date which goes as early as 100000 years B.P. (Clark 1976 : 175-198). In the case of India a majority of dates range between 40000-15000 years B.P. and only in a few cases are the dates earlier than those of 40000 years B.P, (Joshi *et al* 1980 : 47-64).

The above review of the Middle Palaeolithic culture of India shows a great uniformity of this culture cutting across all types of environments and physiographic locations of the sites. There are minor differences in the composition or percentage of various components of the Middle Palaeolithic. Although there is a preference to fine grained silica mineral coarse grained materials like quartzite

have also been equally efficiently utilized in making these tools. Since no human fossil has been found in India nothing can be said of the human types of this period But if we take into consideration the typological parallel as well as the chronology the makers of these industries seem to be of Neanderthal group.

**Quantitative Study of the Scrapers**

Statistical approach for the study of archaeological antiquities is a recent development and has now proved to be useful for the classification of different types of material. Bordes (1961) is the first who applied statistical method over a wide area of Europe, North Africa, Asia etc. Derek Roe (1964 : 245-267) after modifying the Bordes method of study tried it for the British Lower and Middle Palaeolithic material and also standardized forms occurring at Kalambo falls (in press).

In India too, such studies have been carried out. To mention a few : Ghosh and Ray (1964 : 50-74), Misra (1967), Jayaswal and Pant (1973 : 38-53), Jayaswal (1978 : 85-223), Lele and Koti (1970 : 64-74), Joshi and Marathe (1976 : 48-60 and 1975-76 : 4-12).

Scrapers are the main tools of the Middle Palaeolithic industries and at most of the sites in the sub-continent, they form the largest group among the shaped tools and the Middle Palaeolithic industry of the upper Mahanadi is no exception to it. Although the tools of this industry have been collected from several sites for the quantitative study, Middle Palaeolithic collection as a whole is considered.

The quantitative characters of the group of scrapers are given below : (Figs. 30-33).

(1) Maximum weight in gms. (W)
(2) Maximum length in mm (L)
(3) Maximum breadth in mm (B)
(4) Maximum thickness in mm (T)
(5) Maximum area in sq. mm (A)
(6) The Linear Working edge in mm (LWE)
(7) The Peripheral area in mm (P)

Having obtained the above said seven measurements the statistical approaches carried out are as under :

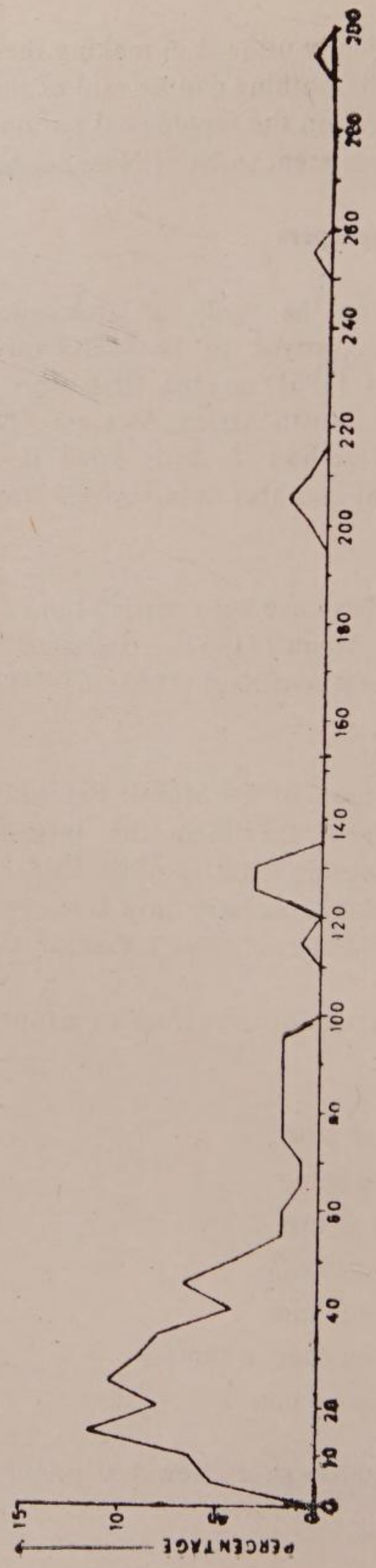



Fig. 30. Middle Palaeolithic scrapers : Variation in Height

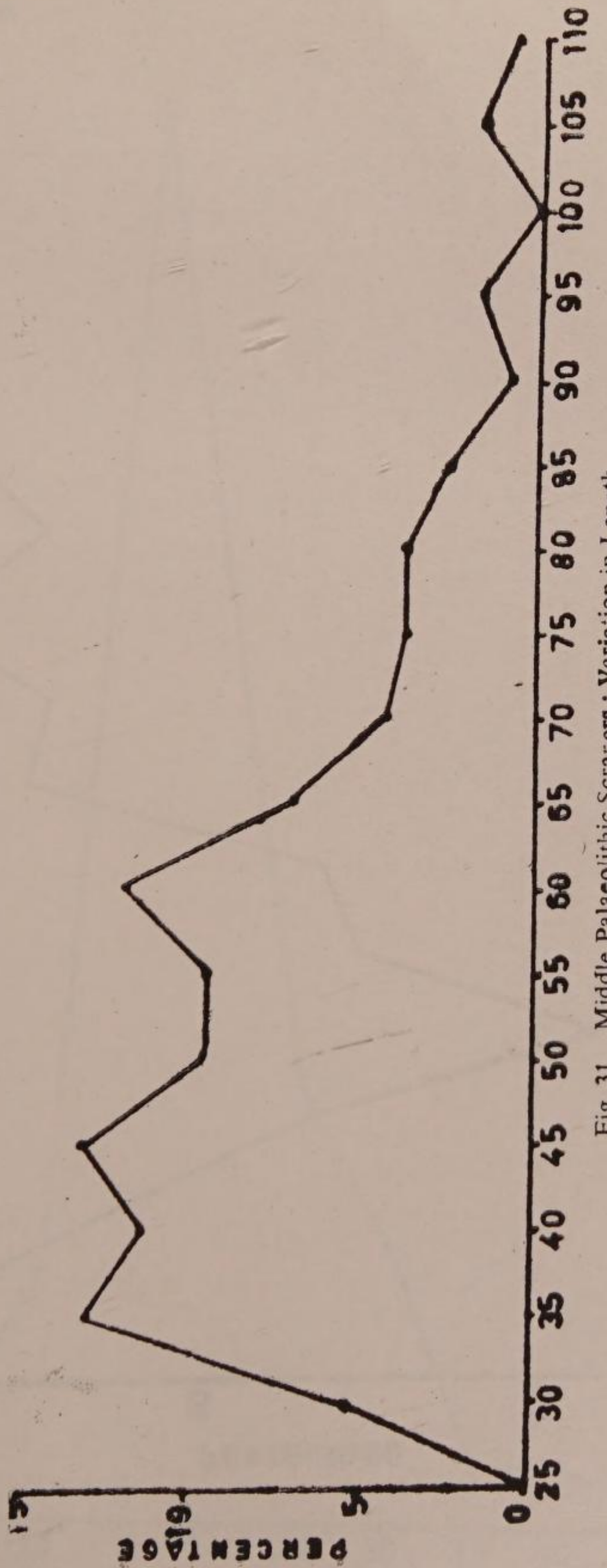



Fig. 31. Middle Palaeolithic Scrapers : Variation in Length

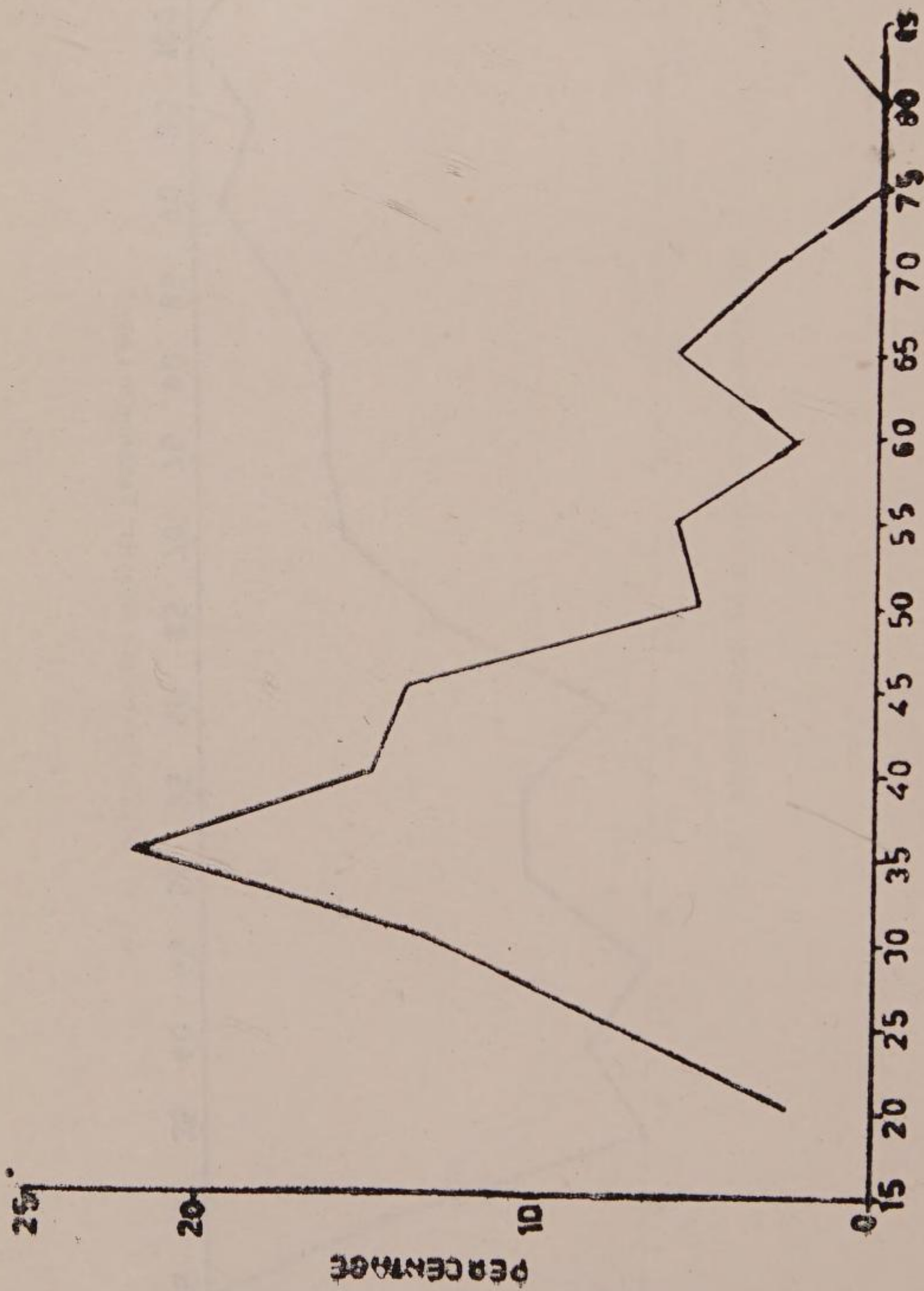



Fig. 32. Middle Palaeolithic scrapers : Variation in Breadth

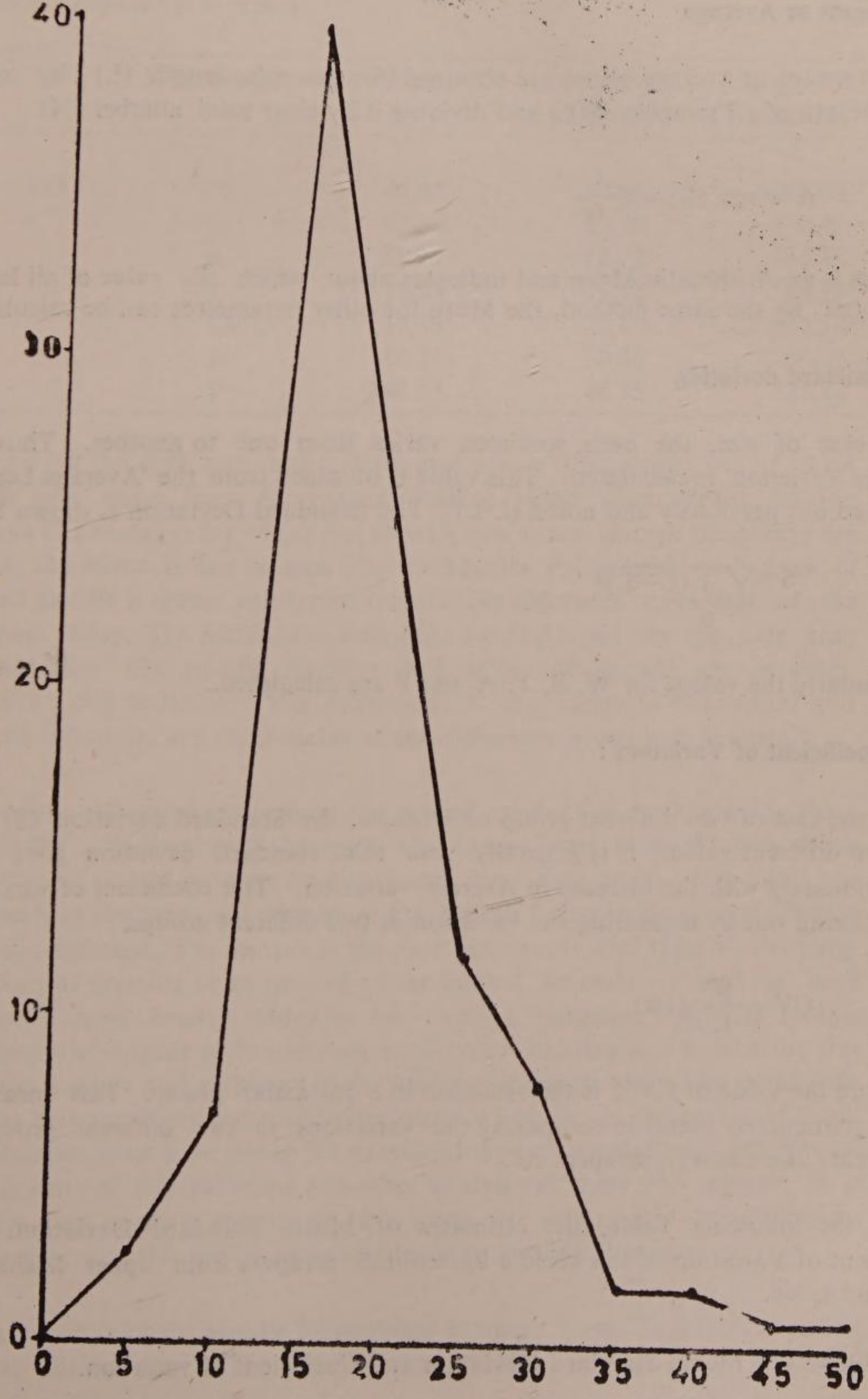



Fig. 33. Middle Palaeolithic Scrapers : Variation in Thickness

**(A) Means or Average**

The means or average values are obtained (for example, length (L) ) by totalling the length of all scrapers $\leq(L)$ and dividing it by their total number (N)

$$\text{Average } (L) = \leq \frac{L}{N}$$

This is an Arithmatic Mean and indicates about which the value of all length are centred. By the same method, the Mean for other parametres can be calculated.

**(B) Standard deviation**

In case of size, the each specimen varies from one to another. Thus the 'Average Variation' is calculated. This value is obtained from the 'Average Length' as worked out previously and noted $(L\text{-}L)^2$. The Standard Deviation is shown by :

$$S = \sqrt{\frac{1}{n}(L-L)^2}$$

Similarly the values for W, B, T, A and P are calculated.

**(C) Coefficient of Variation :**

In the case of two different group of artifacts, the 'Standard deviation' (S) may have two different values. It is generally seen that standard deviation goes high proportionately with the increase in Average variation. The coefficient of variation (CV) is found out by measuring the variation in two different groups.

$$CV = \frac{S}{L} \times 100$$

More the value of CV% is the variation in a particular group. This measurement is particularly useful in comparing the variations in two different group of implements like cleavers, scrapers etc.

In the following Table, the estimates of Mean, Standard Deviation, and Coefficient of Variation of the Middle Palaeolithic scrapers from upper Mahanadi valley are given.

Estimates of Mean, Standard Deviation and Coefficient of variation.

The Middle Palaeolithic scrapers

| *Industry* | *No* | *Parametres* | *Mean* | *Standard deviation* | *Coefficient variation* |
|---|---|---|---|---|---|
| upper Mahanadi valley | 113 | W | 48.53 | 54.68 | 2962.94 |
| | | L | 51.38 | 17.70 | 310.43 |
| | | B | 39.28 | 12.92 | 165.42 |
| | | T | 17.33 | 7.42 | 54.56 |
| | | LWE | 37.48 | 24.47 | 593.36 |
| | | A | 16.11 | 10.66 | 66.17 |
| | | P | 148.54 | 48.55 | 325.48 |

For finding out the difference in the above said values, the comparison of these has been made with those from Bhavnagar, Rajkot Hiran (Saurashtra) and the Middle Krishna (Karnataka) for which the above given values (except periphery) are available. On the whole it can be seen that the Middle Palaeolithic industries of Saurashtra and middle Krishna exhibit no remarkable difference from that of the upper Mahanadi valley. The Saurashtra industries are fashioned on the acid trap while other industries like middle Krishna and upper Mahanadi are on chert. Korisettar (1979 : 289) feels that "the difference in the values of Saurashtra and middle Krishna industries are attributable to the difference in the raw material".

In spite of the statistical concordance in several values (W, L, B and T), there is difference in the L W E value of the upper Mahanadi from those of other above mentioned areas. It should however be mentioned here that these differences do not convey much as the types of activities of the Middle Palaeolithic groups of these regions were not different. The scraper is the most important tool type for discharging the functions of dressing or processing of the hunted animals or making bone and wood tools (arrow heads) evidently for hunting purposes. All the Middle Palaeolithic localities appear to be camping sites where hunting and butchering was practised by the hunters and gatherers in the Mahanadi region which lies in the sub-humid climatic belt and Karnataka and Saurashtra which lie in the semi-arid tract. Both the landscapes must have borne the grassland type of vegetation. But it must be said that in spite of this statistical and other analysis of these two regions, it is difficult to give any positive reason at this stage for explaining the differences between the scrapers of this region as brought out by statistical studies.

Quantitative characters, Middle Palaeolithic scrapers from Saurashtra middle Krishna (After Chakrabarti, 1978 : and Korisettar 1979) :

| *Industry* | *No* | *Parametres* | *Mean* | *Standard deviation* | *Coefficient of variation* |
|---|---|---|---|---|---|
| Bhavnagar | 208 | W | 45.85 | 48.66 | 106.13 |
| | | L | 53.80 | 17.40 | 32.35 |
| | | B | 38.46 | 14.58 | 37.90 |
| | | T | 17.94 | 7.57 | 42.19 |
| | | LWE | 62.82 | 35.38 | 57.23 |
| | | A | 1138.35 | 712.46 | 62.59 |
| Rajkot | 102 | W | 45.00 | 35.49 | 78.85 |
| | | L | 53.28 | 14.80 | 27.81 |
| | | B | 40.67 | 11.00 | 27.07 |
| | | T | 19.50 | 10.12 | 51.90 |
| | | LWE | 63.04 | 34.19 | 54.23 |
| | | A | 1150.70 | 625.51 | 54.36 |
| Hiran | 43 | W | 48.69 | 41.03 | 82.25 |
| | | L | 54.32 | 15.82 | 29.13 |
| | | B | 38.77 | 12.50 | 32.25 |
| | | T | 20.05 | 8.01 | 39.95 |
| | | LWE | 76.11 | 37.27 | 48.97 |
| | | A | 1091.36 | 591.76 | 54.22 |
| The Middle Krishna | 404 | W | 39.01 | 57.21 | 146.66 |
| | | L | 51.39 | 15.08 | 29.35 |
| | | B | 35.95 | 11.93 | 33.19 |
| | | T | 16.97 | 6.52 | 38.43 |
| | | LWE | 55.77 | 34.03 | 61.02 |
| | | A | 15.98 | 10.361 | 64.81 |

## D. Upper Palaeolithic Culture

In Central India earlier evidences of the existence of the Upper Palaeolithic culture are from the most important sites of Bhimbetka and Adamgarh rock shelters. Their occurrence in the Mahanadi basin had proved that this region was also equally suitable for Upper Palaeolithic habitation. The sites of this culture are found only on the Seonath, a major tributary of the Mahanadi. Four localities, namely Simga-III, Simga-IV Bansankra and Amlidih, have been discovered which are situated on the gravel-II as well as on the river flood plain covered with fragments of shale rock and reddish soil. Other important tributaries of the Mahanadi such as the Hasdo and the Jonk did not yield evidences of this culture. It is interesting to mention that alongwith the tools of this industry were found fresh water molluscan shells and $C^{14}$ date of the same is expected soon.

In order to estimate the various aspects of the Upper Palaeolithic industry a cluster of these tools having the largest and undisturbed concentration spread over 4 sq. m. was selected at Simga (*Plate 7*). It was divided into four quadrants, each measuring 1 sq. m. From each square all the artifacts as well as debitage were collected and analysed separately. Typological distribution of each square is given in the Table 19.

At Simga an area of about 500×200 m over which this collection occurs is covered by vegetation and at several places it appears to be little disturbed. As such total collection by applying grid system could not be obtained. But the whole area was carefully examined to cheque whether there are any additional tool types than those represented in the gridded area.

The site-wise distribution of the Upper Palaeolithic collection is given in the Table 18. This industry is represented by 9 types of shaped tools. The types represented among the shaped tools are : (Fig. 34).

Scrapers
Borers
Points
Knives
Choppers
Burins
Worked blades
Worked micro-blades
Lunates

TABLE 18

**Site-wise and type-wise distribution of the Upper Palaeolithic Tools**

| *Tool types* | *Simga III* | *Simga IV* | *Bansankra* | *Amlidih* | *Total* | *G. Total* | *Percentage* |
|---|---|---|---|---|---|---|---|
| **Shaped tools (19.25%)** | | | | | | | |
| *Scrapers* | | | | | | | |
| *Side scraper* | | | | | | | |
| Concave | 18 | 5 | 7 | 7 | 37 | | |
| Convex | 23 | 3 | 6 | 4 | 35 | | |
| Straight | 1 | — | 3 | 1 | 5 | | |
| Notched | 5 | 4 | 4 | 1 | 14 | | |
| *Double scraper* | | | | | | | |
| Concavo-convex | 4 | 3 | — | — | 7 | | |
| Biconcave | 2 | — | — | — | 2 | | |
| Straight-convex | 1 | — | — | — | 1 | | |
| Combined scraper | 1 | — | — | 1 | 2 | | |
| End scraper | 9 | 2 | 3 | — | 14 | | |
| Core scraper | 7 | 3 | 1 | 12 | 23 | 141 | 48.45 |
| Borers | 1 | 1 | — | 3 | 5 | 5 | 1.72 |
| Knives | 5 | 3 | 4 | 6 | 18 | 18 | 6.18 |
| *Burins* | | | | | | | |
| Angular | 3 | — | 2 | 4 | 9 | | |
| Oblique | 7 | 1 | 66 | 4 | 18 | | |
| Parrot beak | 1 | 2 | — | — | 3 | 30 | 10.32 |
| *Points* | | | | | | | |
| Simple | 1 | 2 | 4 | 4 | 11 | | |
| One margin retouched | 5 | 1 | 3 | 3 | 12 | | |
| Both margin retouched | 2 | — | 1 | 1 | 4 | | |
| Leaf shaped | — | — | 1 | 1 | 2 | 29 | 9.96 |
| *Lunates* | | | | | | | |
| Symetrical | 1 | — | — | — | 1 | | |
| Asymetrical | 1 | 1 | 3 | — | 5 | | |
| Broken | 6 | 1 | — | — | 7 | 13 | 4.47 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Blades* | | | | | | | |
| One margin retouched | 5 | 2 | 2 | — | 9 | | |
| Both marg n retouched | — | 1 | — | — | 1 | | |
| Backed blunted | 4 | — | 3 | — | 7 | | |
| Oblique truncated | 2 | — | 1 | — | 3 | 20 | 6.87 |
| Micro-blades | | | | | | | |
| One margin retouched | 6 | 1 | — | 1 | 8 | | |
| Both margin retouched | 1 | 1 | — | — | 2 | | |
| Backed | 3 | 3 | 5 | 1 | 12 | 22 | 7.56 |
| Choppers | 1 | 4 | 2 | 6 | 13 | 13 | 4.47 |
| Total | 126 | 44 | 61 | 60 | 291 | 291 | 100.00 |
| **Simple artifacts (80.45%)** | | | | | | | |
| *Cores* | | | | | | | |
| Flake cores | 37 | 16 | 14 | 17 | 84 | | |
| Blade cores | 7 | 7 | 7 | 4 | 25 | | |
| Micro-blade core | 20 | 16 | 20 | 9 | 65 | | |
| Discoid | — | 1 | — | — | 1 | 175 | 14.33 |
| *Flakes* | | | | | | | |
| End flakes | 54 | 34 | 38 | 25 | 151 | | |
| Side flakes | 18 | 14 | 18 | 6 | 56 | | |
| Indeterminate flakes | — | 6 | — | — | 6 | | |
| Utilized flakes | 24 | — | — | — | 24 | 237 | 19.41 |
| Flake-blades | 34 | 22 | 39 | 13 | 118 | 118 | 8.20 |
| Core rejuvenation flakes | 7 | 3 | 5 | 3 | 18 | 18 | 0.65 |
| *Blades* | | | | | | | |
| Complete blades | 26 | 14 | 42 | 18 | 100 | | |
| Broken blades | 22 | 5 | 19 | 10 | 56 | | |
| Utillzed blades | 4 | 2 | 6 | — | 12 | | |
| Mid guided ridged blades | 8 | 2 | 5 | — | 15 | 183 | 15.00 |
| *Micro-blades* | | | | | | | |
| Complete micro-blades | 29 | 7 | 43 | 1 | 80 | | |
| Broken micro-blades | 47 | 6 | 13 | — | 66 | | |
| Utilized micro-blades | 4 | — | 4 | — | 8 | 154 | 12.62 |
| Chips | 125 | 31 | 45 | 19 | 220 | 220 | 18.00 |
| Worked nodules | 72 | 7 | 7 | 16 | 102 | 102 | 8.35 |
| Rejects | 42 | — | — | — | 42 | 42 | 3.44 |
| Total | 573 | 190 | 320 | 138 | 1221 | | 100.00 |

TABLE 19

**Tools collected by Grid systems at Simga IV**

**Simple artifacts**

| *Tool types* | *Sq. 1* | *Sq. 2* | *Sq. 3* | *Sq. 4* | *Total* |
|---|---|---|---|---|---|
| *Cores* | | | | | |
| Flake core | 3 | 3 | 6 | 2 | 14 |
| Micro-blade core | 1 | 2 | 2 | 3 | 8 |
| *Flakes* | | | | | |
| End flake | 8 | 9 | 5 | 5 | 27 |
| Side flake | 1 | 4 | 2 | 3 | 10 |
| Utilized | 8 | 6 | 6 | 4 | 24 |
| Flake-blade | — | 3 | 1 | — | 4 |
| Core rej. flakes | — | 1 | — | — | 1 |
| *Blades* | | | | | |
| Complete blade | 3 | — | — | — | 3 |
| Broken micro-blade | 5 | 2 | — | — | 7 |
| Utilized | 2 | — | — | — | 2 |
| *Micro-blades* | | | | | |
| Complete Micro blade | 1 | 3 | 2 | 2 | 8 |
| Broken micro-blades | 6 | 10 | 5 | 10 | 31 |
| Chips | 28 | 24 | 13 | 29 | 94 |
| Worked Nodule | 17 | 12 | 23 | 10 | 62 |
| Rejects | 13 | 8 | 12 | 9 | 42 |
| Total | 96 | 87 | 77 | 78 | 338 |
| *Blades* | | | | | |
| One margin retouch | 1 | 1 | 1 | — | 3 |
| Oblique retouch | — | 1 | — | — | 1 |
| Base retouch | — | — | — | 1 | 1 |
| *Micro-blades* | | | | | |
| One margin retouch | 1 | 1 | 1 | — | 3 |
| Backed blade | — | 1 | — | — | 1 |
| Burins | 1 | 1 | — | — | 2 |
| Points | | | | | |
| One margin retouch | 1 | — | — | — | 1 |
| *Lunates* (broken) | — | — | 1 | — | 1 |
| *Scrapers* | | | | | |
| Concave | 2 | 4 | 2 | — | 8 |
| Convex | 1 | 2 | 2 | 2 | 6 |
| Notched | 1 | 1 | — | — | 2 |
| Concavo-Convex | — | 1 | — | — | 1 |
| End scraper | — | 1 | — | — | 1 |
| Core scraper | — | — | 1 | 1 | 2 |
| Borer | 1 | — | 1 | — | 2 |
| Total | 8 | 14 | 9 | 4 | 35 |

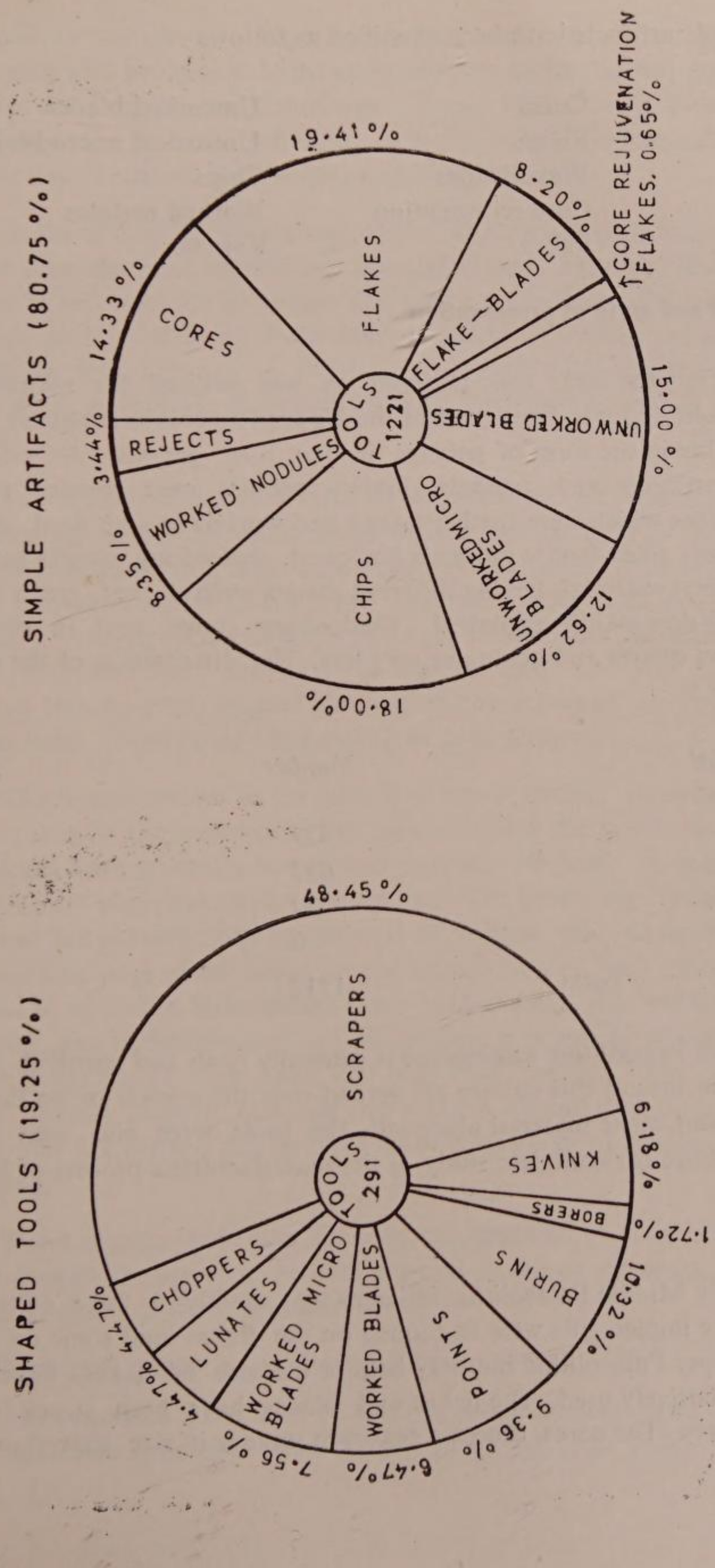



**Fig. 34. Distribution of Upper Palaeolithic Tool Types**

The simple artifacts have been classified as follows :

| | |
|---|---|
| Cores | Unworked blades |
| Flakes | Unworked micro-blades |
| Flake-blades | Chips |
| Core rejuvenation flakes | Worked nodules |
| | Rejects. |

**Raw material and state of preservation**

More or less the same raw material as was utilized for manufacturing the Middle Palaeolithic tools, continued in the Upper Palaeolithic industry also. It was readily available in the form of pebbles in the river gravels. As evident by the presence of cortex-covered artifacts, mainly pebbles were selected to struck off flakes and blades which were further flaked and worked to give final shape to the specimens. Only silica family minerals viz. chert, chalcedony, quartz and agate were in use. The chert material, having different shades such as red, green yellow, black and white was dominantly exploited. Chalcedony comes next in order and the pieces made on quartz and agate are very less. The distribution of the raw material is given below :

| *Raw material* | *Number* | *Percentage* |
|---|---|---|
| Chert | 839 | 55.49 |
| Chalcedony | 637 | 42.14 |
| Quartz | 30 | 1.98 |
| Agate | 6 | 0.39 |
| Total | 1512 | 100.00 |

The Upper Palaeolithic assemblage is generally fresh and unrolled. As has been said earlier, the sites of this culture are spread over the gravels or on the plain land. The debitage and waste material alongwith the tools were also seen at the sites providing facilities for complete study of the manufacturing process of the tools.

**Technology**

The earlier Middle Palaeolithic industry was mainly a flake culture and the majority of the implements were fashioned on the flakes and some on flake-blades. But in the Upper Palaeolithic industry besides the use of flakes, flake-blades and blades are extensively used. The flakes and blades have been struck off from the varieties of cores. The cores, except a few, are smaller in size than those of Middle

Palaeolithic industry. In majority of the cases, the flakes possess plain striking platforms and prominent bulbs of percussion on the ventral surfaces and irregular smaller scars on the dorsal surfaces. These flakes must have been detached by applying stone hammer technique. The flakes carrying centrally directed flake-scars on the dorsal surface and faceted platforms are rare.

In the collection, blades and micro-blades also constitute a good percentage, These generally bear narrow and plain platforms with tiny bulbs of percussion due to use of soft hammer technique and punch or pressure technique. After the production some of them have also been properly retouched to serve as regular tools. Although this industry is distinct in certain characteristics it does possess some tool types comparable to those of Middle Palaeolithic and also a few microlithic types.

The collection includes varieties of scrapers on which the working edge is achieved either on the longer margins or at the ends. The secondary work, steep and shallow in nature, is found on both the surfaces. However, the steep retouch from ventral to dorsal side is more frequent. Core tools are also present in this industry. Among them choppers and core scrapers are the main types. The choppers are of bifacial variety and have the edge on only one end leaving the remaining portion intact cortex. Several blade cores characterised by flutings have sharp edges at the base. These could have served as core scrapers.

The borers present in the collection are of double shouldered variety and have been made by the removal of two notches below the borer tip. The borer tips and shoulders have generally been found properly worked. In some of the cases, the margins are also retouched upto the tips. The burins are generally worked on one end and are characterised by removal of vertical and oblique spalls which forms the working edge of the burins at the intersection of each other. The points which are made on flakes, flake-blades and blades bear the working on either of the margins, and sometimes on both. Sometimes it is seen all along the margin tappering to the point and in a few cases it is only near the tip. The knives generally bear thick natural back on one side and a sharp cutting edge on another. The edges of the knives are formed due to removal of long flakes or blades often on the dorsal surfaces.

These regular tool types made by the application of direct and indirect percussions suggest the use of stone-hammer and punch or pressure technique for giving the final shape to the specimens.

**Typology and description of illustrated tools**

The collection includes 1512 tools in total and have been found from four sites. The maximum collection comes from Simga-III (126 tools). Other sites such as

Bansankra (61), Amlidih (63) and Simga-IV (44) also yielded good number of tools. Amlidih is the only site where lunates are totally absent.

**Shaped tools**

The sites of this culture yielded 291 (19.25%) shaped tools. The scrapers are 140 (48.45%) followed by borers (5 : 1.70%), points (29: 9.96%), knives (18: 6.18%), burins (30 : 10.32%), worked blades (20 : 6.37%), worked micro-blades (22 : 7.40%), lunates (13 : 4.47%) and choppers (13 : 4.42%).

*Scrapers* (121 specimens : 48.45%) (Fig. 35)

Among the scrapers, side scrapers are the most common type. The working edges of these are confined to one as well as on both the margins and include concave, convex, straight, notched, concavo-convex, straighto-convex and biconvex types. The end scrapers are less in number and generally have convex edges. Some of the cores which have sharp scraping edges and regular scars have been classified as core scrapers.

The scrapers are generally fashioned on flakes whereas some examples are there which have been worked on nodules. The scrapers made on blades are few. Mostly the scrapers are retouched unifacially but some examples of bifacial retouching can also be seen. Steep retouches are seen in the concave scrapers.

*Side scraper* (89 specimens)

The side scraper is the dominant type and they could be divided in several groups taking into consideration the working obtained on one of the longer margins. These are concave (36), convex (34), straight (5), and notched (14). Of these 56 are made on chert, 32 on chalcedony, and a solitary piece is on a jasper material.

**Concave**

Among the side scrapers, the concave scrapers are the largest in number and have been obtained from all the sites. Generally concave varieties occur in the Middle Palaeolithic assemblages. But this cannot be the only criterion to designate this collection as of Middle Palaeolithic culture. Even then the upper Mahanadi Upper Palaeolithic industry is significant in having this leading Middle Palaeolithic type of scraper.

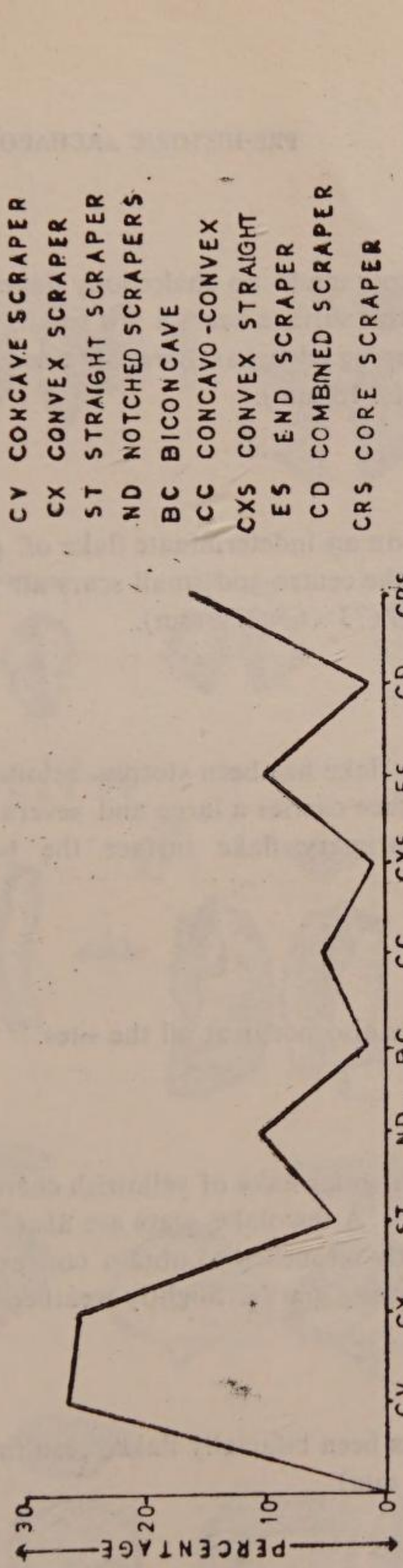



Fig. 35. Distribution of the Upper Palaeolithic Scrapers

*AML-21* (Fig. 36.9)

It is a concave side-scraper made on chalcedony flake-blade. The dorsal surface has got a ridge whereas ventral surface bears a few small, flake scars at the distal and proximal ends. The scraping edge has been obtained on the concave ventral right margin. Fresh (67 × 34 × 18 mm).

*SMG-III-114* (Fig. 37.1)

It is a concave scraper on an indeterminate flake of greenish chert. Both the surfaces bear large scars in the centre and small scars all around. The tool has got battered convex edges. Fresh (73 × 63 × 22 mm).

*BSR-36* : (Fig. 37.2)

An irregular chalcedony flake has been steeply retouched to prepare concave side scraper. The dorsal surface carries a large and several smaller flake scars. On the ventral side is the plain primary flake surface the bulb of which is flaked off. Fresh (33 × 21 × 12 mm).

**Convex**

The convex side scrapers also occur at all the sites.

*SMG-IV-9* : (Fig. 37-3)

It is a scraper on sub-triangular flake of yellowish chert. The dorsal surface bears several scars of different sizes. A few flake scars are also seen on the ventral side. The left dorsal side is properly retouched to obtain convex scraping edge while the opposite margin carries battering marks. Slightly weathered. (48 × 37 × 14 mm).

*AML-11* : (Fig. 36.7)

A thick chert nodule has been bifacially flaked resulting to form a convex side scraper. Fresh (46 × 32 × 14 mm).

**Straight**

Straight side scrapers are represented by the smallest number and are from Simga-III, Bansankra and Amlidih sites.

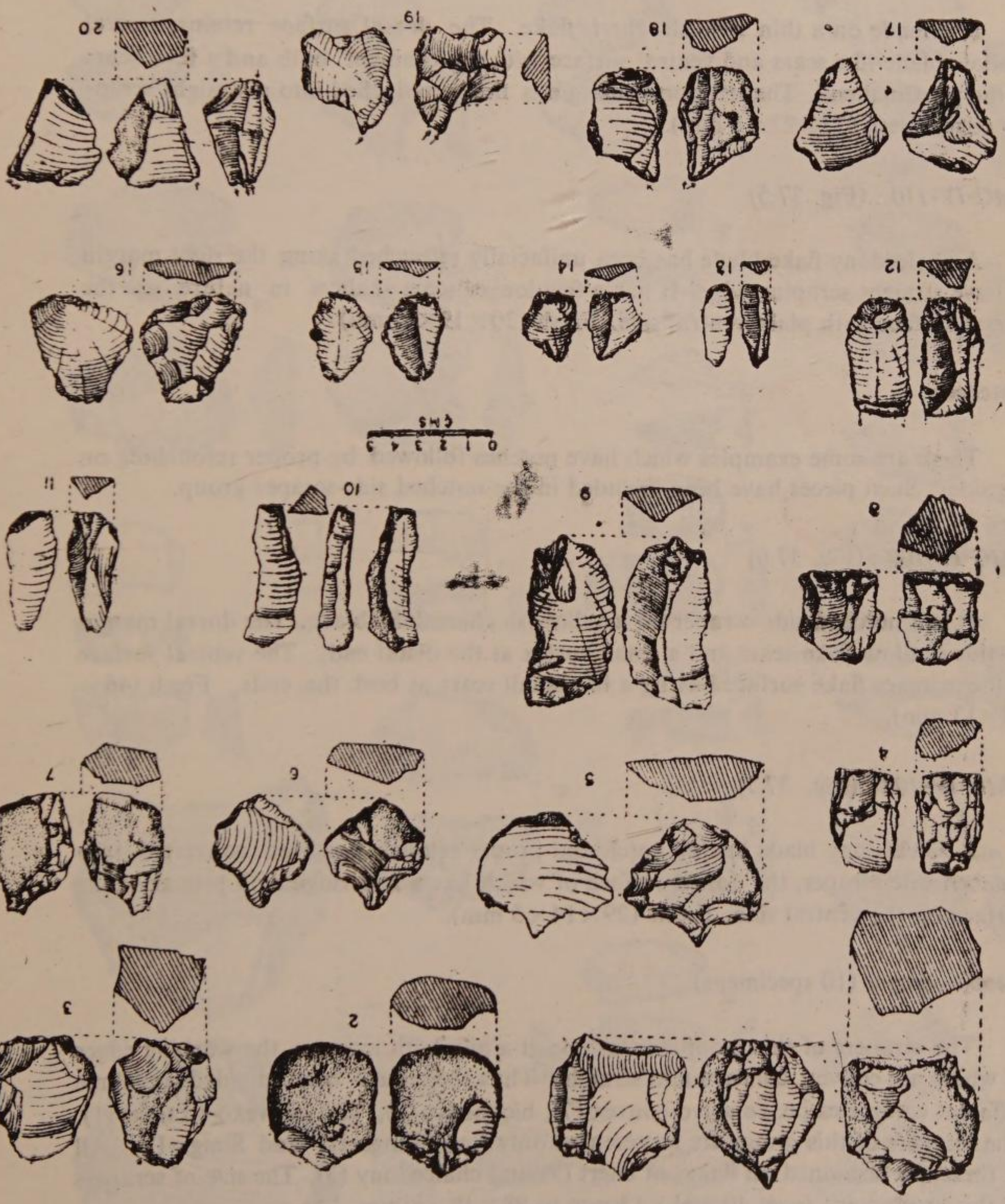


Fig. 36. Upper Palaeolithic Tools.

*SMG-III-18* : (Fig. 36.4)

It is made on a thin reddish chert flake. The dorsal surface retains several shallow blade-like scars and ventral surface with a prominent bulb and a few scars at the proximal end. The left dorsal margin is finely retouched into a straight scraping edge. Fresh (32×22×8 mm).

*SMG-IV-110* : (Fig. 37.5)

A chalcedony flake-blade has been unifacially retouched along the right margin to have straight scraping edge. It has a few longer scars shallow in nature on the dorsal surface with plain ventral side. Fresh (30×19×7 mm)

**Notched**

There are some examples which have notches followed by proper retouching on the sides. Such pieces have been included in the notched side-scraper group.

*SMG-IV-109* : (Fig. 37.6)

It is a notched side-scraper on a yellowish chert flake-blade. The dorsal margin retains shallow flake-scars and a small cortex at the distal end. The ventral surface is the primary flake surface having a few small scars at both the ends. Fresh (46×27×13 mm).

*SMG-IV-103* : (Fig. 37.7)

A chalcedony blade having notch and proper retouch has been converted into notched side scraper, the dorsal surface of which has a mid ridge with primary flake surface on the ventral side. Fresh (29×14×5 mm).

*Double-scraper* (10 specimens)

The scrapers of this group are fashioned along both margins the working edges of which are convex, concave and straight. Thus these have been divided in three different categories i.e. concavo-convex (7), biconcave (2), and convexo-straight (1). The scrapers of this group are represented only from Simga-III and Simga-IV. All of these are fashioned on flakes of chert (7) and chalcedony (3). The size of scrapers of this group vary from 40×31×13 mm to 98×18×8 mm.

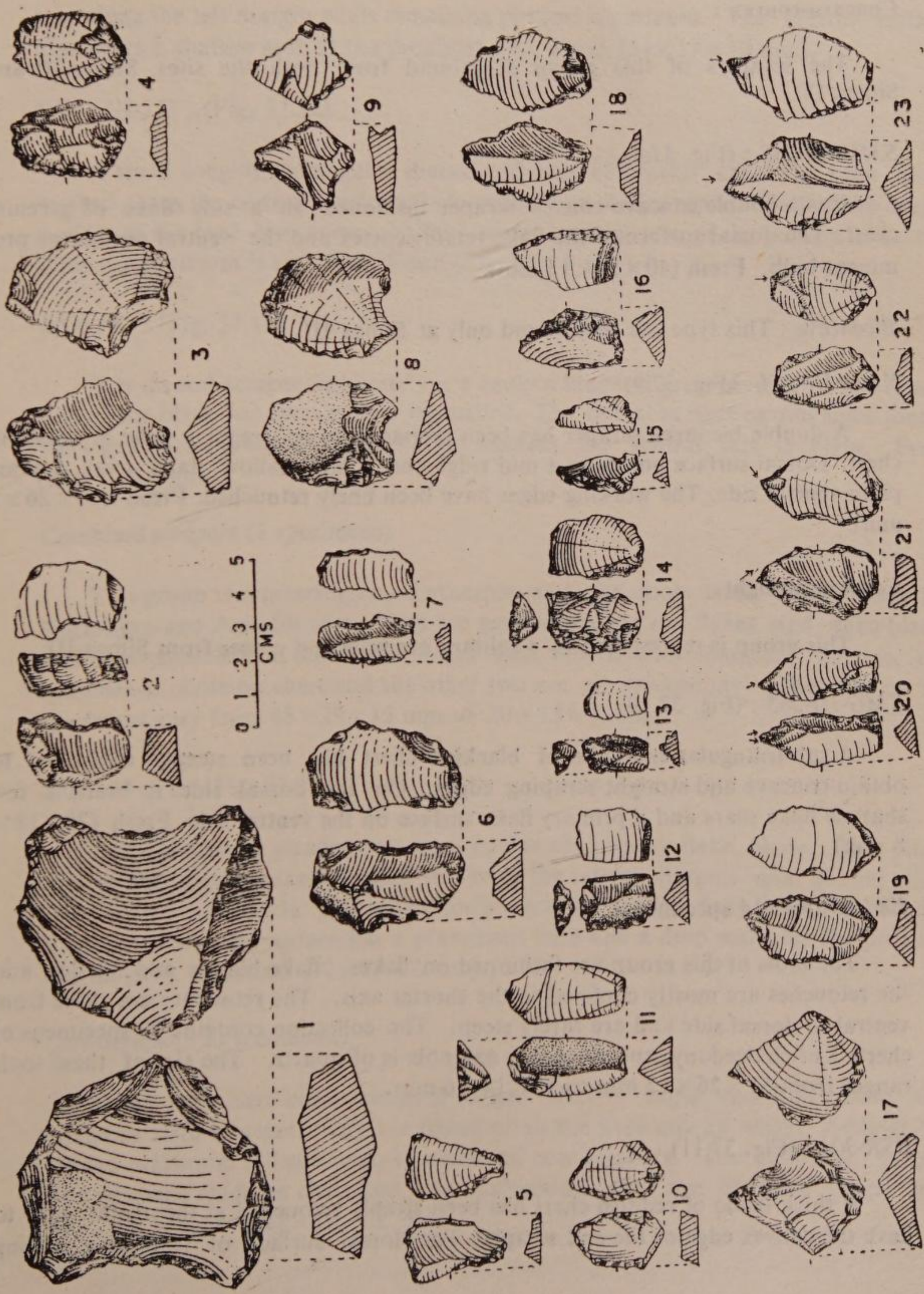



Fig. 37. Upper Palaeolithic Tools

**Concavo-convex :**

The scrapers of this group are found from both the sites, Simga-III and Simga-IV.

*SMG-III-258* : (Fig. 37.8)

It is a double concavo-convex scraper fashioned on a side flake of greenish chert. The dorsal surface of the flake retains cortex and the ventral one shows prominent bulb. Fresh (40×31×13 mm).

*Biconcave* : This type has been found only at Simga-III.

*SMG-III-264* : (Fig. 37.9)

A double biconvex scraper has been prepared on an irregular flake of greenish chert. Dorsal surface possesses a mid ridge and some shallow flake scars, having plain ventral side. The working edges have been finely retouched. Fresh (29×26×8 mm).

**Convexy-straight**

This group is represented by a solitary example and comes from Simga-III.

*SMG-III-265* : (Fig. 37.10)

A sub-triangular end flake of blackish chert has been steeply retouched to obtain concave and straight scraping edges. On the dorsal side it bears a few shallow flake scars and a primary flake surface on the ventral side. Fresh (28×18×8 mm)

*End scraper* (14 specimens)

The tools of this group are fashioned on flakes, flake-blades and blades and the retouches are mostly confined to the shorter axis. The retouches are done from ventral to dorsal side and are rarely steep. The collection contains 10 specimens of chert, 3 of chalcedony, and a solitary example is of quartz. The size of these tools ranges from 51×26×12 mm to 18×14×6 mm.

*BSR-301* : (Fig. 37.11)

A thick blade of reddish chert has been steeply retouched at the distal end to have the convex edge of the end scraper. The dorsal surface of it retains a long

scar along the left margin while remaining portion is cortexed. The ventral surface also bears a shallow scar at the proximal end. Fresh (34×17×10 mm).

*SMG-III-273* : (Fig. 37.12)

A small roughly rectangular shaped end-flake of whitish chert has been finely worked along the convex shorter axis to prepare an end-scraper. Half of the dorsal surface of the tool has some shallow scars leaving rest of the portion as cortex. Bulb and platform is not clear. Fresh (23×16×7 mm).

*BSR-356* : (Fig. 37.13)

It is an end-scraper fashioned on a broken blade of greenish chert. The dorsal side of the blade has been steeply retouched. The dorsal surface carries some longer scars and cortex along the right margin whereas the ventral side is plain. Fresh (20×12×6 mm).

*Combined scrapers* (3 specimens)

This group is represented by 3 examples and the tools come from Simga-III, Bansankra and Amlidih sites. They are generally made on flakes and flake-blades and have retouches on one of the longer and one shorter margins. In this, one specimen is made on chert and the other two are on chalcedony. The size of the specimens vary from 48×29×15 mm to 20×15×7 mm.

*SMG-III-271* : (Fig. 37.14)

It is a combined scraper on a rectangular chalcedony flake blade. The retouches in this specimen are confined to one of the lateral margins and at the distal end towards dorsal side. The upper surface retains shallow flake scars of different sizes whereas under surface has a prominent bulb and a deep scar near the proximal end. Slightly patinated (30×19×8 mm).

*Core-scraper* (23 specimens)

Some cores have been retouched to get effective edges and they could have served as core scrapers. They are found at all the sites among which Amlidih has yielded maximum (12 specimens) number of core scrapers. The collection includes 14 specimens made on chert and 9 on chalcedony. The size of these ranges from 54×70×32 mm to 22×30×22 mm.

*BSR-17* : (Fig. 39.6)

A roughly round core scraper on blackish chert carries blades scars all around. Lower surface retains cortex except some smaller flake scars due to which the working edge of the core scraper is obtained. Fresh (36×23×21 mm).

*BSR-155* : (Fig. 39.7)

A core scraper is made on blakish chert. Half of the portion of it is steeply flaked to prepare sharp scraping edge. The flaking is unifacial and shows stepped-scars. Fresh (26×33×26 mm).

*AML-8* : (Fig. 36.8)

It is a core scraper made on fluted core of brown chert. Parallel sided blades have been detached all over resulting a convex edge at the base which could have served as scraping edge. Fresh (40×32×26 mm).

*b. Borer* (5 specimens 1.70%)

Out of 5 examples, one each is from Simga-III and Simga-IV and the remaining 3 are from Amlidih site. They are generally made on flakes and their tips have been achieved by removal of two notches near the tips followed by retouches. Out of five, three are made on chert, and two are on chalcedony. Their size ranges between 49×52×19 mm and 42×32×18 mm.

*AML-23* : (Fig. 36.5)

It is a double shouldered borer made on an end-flake of chalcedony. Dorsal surface of the tool carries centrally directed flake scars. The bulb is missing on the ventral side. It has been retouched on both the sides of the tip. Patinated (42×39×16 mm).

*AML-22* : (Fig. 36.6)

A borer has been fashioned on the whitish chert flake. The dorsal surface possesses several scars leaving a patch of cortex at the left lateral margin. The borer tip has been produced at one of the ends and has finely been retouched. Slightly weathered. (49×52×19 mm).

*c. Point* (29 specimens : 9.96%)

The points also form an important type in the collection and they are found at all the sites. In them those made on flake-blade are dominant whereas those on

flakes and blades are rare. Among these 14 are on chert and 15 on chalcedony. On the basis of retouch the whole group has been divided in four categories :

I. Simple points (11 specimens)
II. One margin retouched points (12 specimens)
III. Both margins retouched points (4 specimens)
IV. Leaf-shaped points (2 specimens)

All the specimens of this group have unifacial working, some examples, specially both margin-retouched points have working on both the surfaces i.e. on one margin it is on dorsal surface whereas on another one it is on ventral side.

*I. AML-26* : (Fig. 36.14)

It is a simple point made on a sub-triangular chert flake. On the dorsal surface it has a mid ridge and some small flake scars at the proximal end of the ventral surface. The margins which converge to a point bear utilization marks. Fresh (29×24×8 mm).

*BSR-299* : (Fig. 37.15)

A chalcedony flake blade tappers to a point having a ridge on the dorsal surface. It has got use-marks along one of the margins and an incipient tang at the base. Fresh (25×10×5 mm).

*II. SMG-IV-156* : (Fig. 37.18)

A sub-triangular side-flake of chalcedony has been converted into a one-margin retouched point. It carries a median ridge and several flake scars on the dorsal surface, and a prominent bulb on the ventral side. The retouch is unifacial. Fresh (42×36×12 mm).

*III. BSR-333* : (Fig. 37.16)

A triangular flake blade of chalcedony has been retouched along both the margins to form a pointed tip at the distal end. The dorsal surface has some small scars and little cortex on the dorsal right margin. On the ventral surface it has a deep scar at the base due to which the bulb is absent. The tool is worked on the right margin of both the surfaces. Fresh (32×19×10 mm).

*IV. SMG-IV-293* : (Fig. 37.17)

It is a leaf-shaped point on greenish chert flake. On the dorsal surface it has two ridges whereas the ventral surface is a primary flake surface. Both the margins

of the tool are retouched from bottom upwards to form a pointed tip. Two small scars at the base have produced a tang. Slightly patinated (39×24×9 mm).

*SMG-III-282* : (Fig. 37.19)

A chocolate brown coloured chert flake has been worked into a leaf-shaped point. The dorsal surface bears shallow and longer flake-scars. The pointed tip is confined to the bulbar side due to which bulb is not visible. At the base the tool is thick and retains a small cortex. Fresh (42×22×8 mm).

*d. Knife* (18 specimens 6.18%)

They are found at all the sites of this industry. Out of eighteen examples 9 each are made on chert and chalcedony and are employed mainly on flake-blades and blades. The size of these vary from 56×21×15 mm to 26×12×4 mm.

*AML-20*: (Fig. 36.10)

It is made on chalcedony material and has sharp cutting edge formed by intersection of scars of both the surfaces along one of the margins, leaving thick back opposite to the cutting edge. Fresh (56×21×15 mm).

(*e*) *Burin*: (30 specimens: 10.20%)

The burins form an important type in this collection and are found at all the sites. The maximum number of them come from Simga-III (12 specimens). Out of thirty burins, 19 are made on nodules, 8 on flakes while those made on flake-blades and blades are comparatively rare. The effective burin edges of these tools have been obtained by the removing vertical and oblique spalls at one of the ends. They can be classified in three sub-groups: (A) Oblique burins (18), (B) Anguled burin (9) and (C) Parrot beak type (3). Of these sixteen are made on chert and the rest 14 are on chalcedony. The size varies from 43×36×20 to 21×11×8 mm.

*AML-9* (Fig, 36.20)

It is an oblique burin on a thick chert nodule. The burin edge has been formed due to intersection of three oblique and two vertical spalls. Opposite side of the working edge is covered by cortex. Fresh (43×36×20 mm).

*SMG-III-120*: (Fig. 37.21)

A flake-blade of chalcedony has been converted into an oblique burin by

removal of two spalls at the distal end. The ventral surface of the tool carries several parallel scars. Fresh (32×19×5 mm).

*AML-10*; (Fig. 36.18)

An angle burin is made on blackish chert nodule. The intersection of opposite spalls has produced the working edge. The tool retains cortex over upper surface. Fresh (62×32×12 mm).

*AML-18*: (Fig. 37.23)

It is a chalcedony flake and has been prepared into an Angle burin by taking out vertical spalls opposed to each other at the distal end. The dorsal surface of it has a mid ridge. Fresh (45×28×8 mm).

*AML-12* (Fig. 36.19)

An Angled burin is prepared on chalcedony side flake. Two opposite spalls near the proximal end have produced the working edge. Fresh (45×42×13 mm).

*BSR-208*: (Fig. 37.20)

It is an angle burin fashioned on a reddish chert blade. The burin edge has been formed due to intersection of vertical spalls opposite to each other. The tool bears several narrow scars along the right dorsal margin while remaining portion shows a solitary long scar. The ventral surface retains little cortex near the proximal end. Fresh (51×. 6×6 mm).

*SMG-III-291*: (Fig. 37.21)

A flake-blade of greenish chert has been made into a parrot-beak burin by taking out spalls at the distal end. The dorsal surface of the tool bears a few shallow scars. Fresh (39×22×7 mm).

*Worked blades*: (21 specimens)

The intentionally worked blades are included in this group. On the basis of working these have further been divided in several sub-groups viz. (I). One margin-retouched blades (7), (II). Both margins-retouched blades (4), (III). Obliquely truncated blades (3) and (IV). Back blunted blades (6). The blades of this group have been found at all the sites except at Amlidih. Among the worked blades 18

are fashioned on chert, 2 on chalcedony, and a solitary example is on agate. The size of these ranges from 60×23×12 to 24×12×4 mm. In view of their shorter length and overall small size, they might have been used in combination like the composite tools of Mesolithic industries. This is particularly so in case of micro-blades.

*BSR-207*: (Fig. 38.1)

It is a blade on yellowish chert retouched on one margin. The dorsal surface has a ridge and long shallow scar leaving a cortex on the left margin. The ventral surface carries a shallow scar at the proximal end due to which the bulb is crased. The edge has been worked on the left dorsal margin. Fresh (60×23×12 mm).

*AML-15*: (Fig. 36.13)

An agate blade has been retouched along one of the lateral margins and has three longer shallow scars on the dorsal surface. On the ventral surface it is plain. Fresh (32×12×4 mm).

*AML-117*: (Fig. 36.12)

A both margin retouched blade is employed on the grey chert. The dorsal surface of which possesses several longer scars. The blade is broken at the distal end. Fresh (45×23×12 mm).

*BSR-253*: (Fig. 38.6)

It is an oblique truncated blade on whitish chert. The dorsal surface bears several longer scars and a small bulbar scar below the bulb on the ventral side. The retouch is confined on the oblique portion at the distal end. Fresh (38×12×6 mm).

*BSR-283*: (Fig. 38.7)

It is a backed blade made on brown chert. The dorsal surface carries a few shallow scars whereas on the ventral side it has a primary blade surface. Fresh. (32×12×6 mm)

*BSR-344*: (Fig. 38.8)

A backed blade is made on yellowish chert. A ridge and some shallow scars are confined on dorsal surface and utilization mark on the ventral right margin. Fresh (24×12×4 mm).

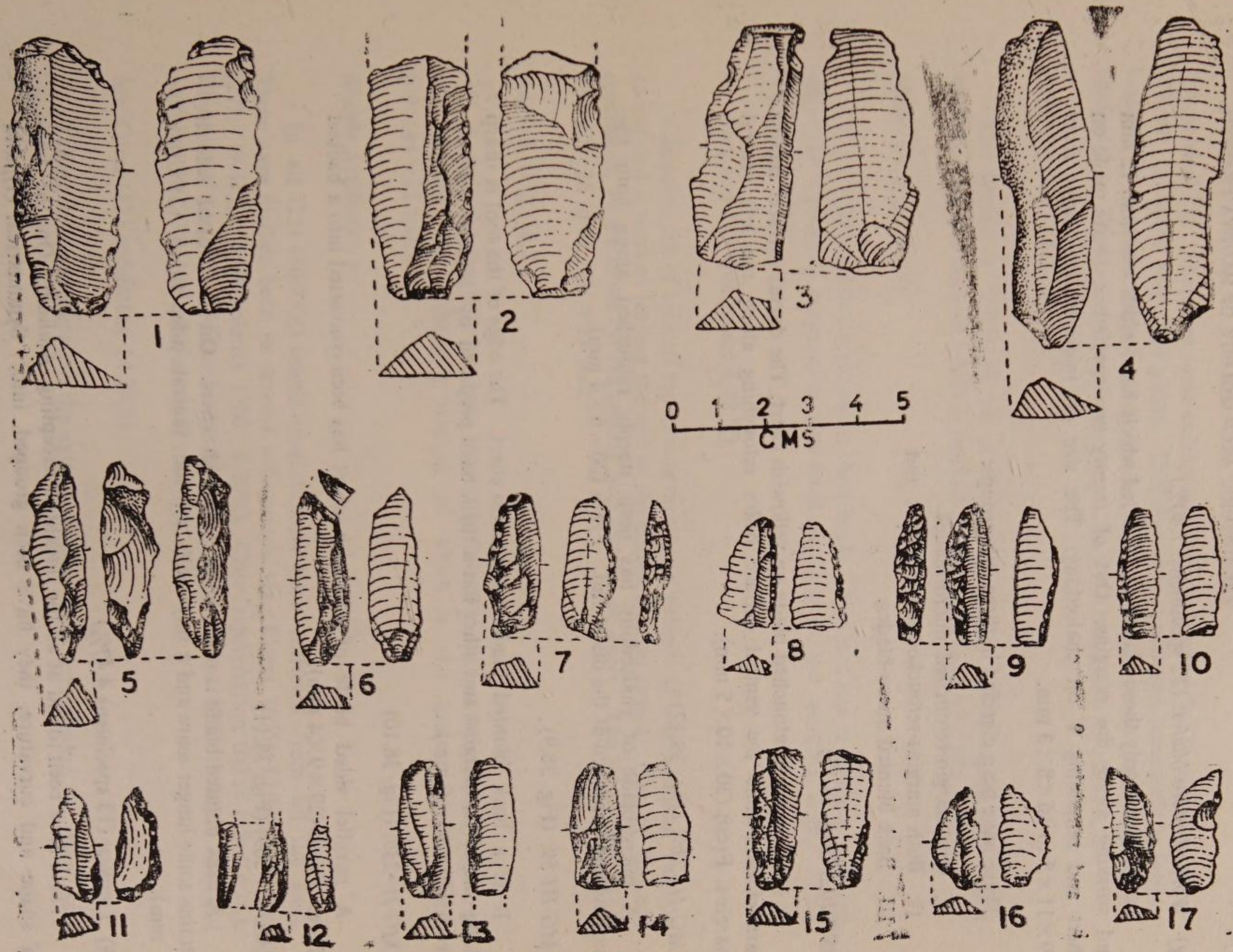



Fig. 38. Upper Palaeolithic Tools

(*g*) *Worked micro-blades*: (22 specimens: 7.40%)

In this group only those blades are included which have width less than 12 mm and working along the margins. Out of twenty two specimens, 13 are made on chert and remaining 9 on chalcedony. The size of micro-blades varies from 29×11×5 to 16×8×3 mm.

These have been clarified in three sub-groups:

I. One margin-retouched micro-blades
II. Both margins-retouched micro-blades and
III. Back blunted micro-blades.

*BSR-102*: (Fig. 38.13)

It is one margin retouched blade on yellowish chert. The dorsal surface retains parallel scars while the ventral surface bears retouching along the left ventral margins. Fresh (30×10×5 mm).

*SMG-III-236*: (Fig. 38.12)

A micro-blade of chalcedony has been steeply retouched along both the margins and is broken at the distal end. Fresh (20×6×4 mm).

*SMG-III-59*: (Fig. 38.9)

It is a back blunted blade on greenish chert. The edge of the tool is sharp along one of the margins and other has a thick back prepared by bifacial retouch. Fresh (30×10×6 mm).

*SMG-IV-236*: (Fig. 38.10)

A parallel sided blade of yellowish chert has been converted into a backed blade. Fresh (29×9×4 mm).

*SMG-III-209*: (Fig. 38.11)

A back blunted blade is made on a yellowish chert. On the dorsal side it retains some longer scars and a tiny bulb on the ventral side. Fresh (25×10×6 mm).

(*h*) *Lunates*: (13 specimens 4.47%)

These have been found at all the localities excepting Amlidih. On the basis of shape and curvature, they have been grouped into: Symmetrical (1), and

Asymetrical (5). There are some examples which are broken due to which it is very difficult to make out their group. Therefore they are shown separately as broken lunates (7). Amongst them 5 examples are made on chert whereas remaining are on chalcedony. The size of these varies from 28×9×4 mm to 16×8×3 mm.

*SMG-IV-244* : (Fig. 38.16)

The lunate is fashioned on a chalcedony blade. It has again the straight working edge, the back of which is worked to convex. Fresh (22×10×4 mm).

*BSR-343*: (Fig. 38.17)

It is a lunate made on yellowish chert blade. The tool has a straight working edge with a properly prepared convex back opposite to the working edge. Fresh (28×9×3 mm).

(*i*) *Choppers* (13 specimens: 4.42 %)

Choppers are of bifacial type made mostly on pebbles of which limited portion at one end is worked leaving the rest of the cortex portion intact. Out of thirteen specimens, 10 are made on chalcedony and rest are on chert : The sizes range from 49×60×26 to 31×31×23 mm.

*AML-2*: (Fig. 36.2)

A chalcedony pebble has been bifacially flaked to obtain the working edge of the chopper. The remaining portion of which is the intact cortex. Fresh (49×44×21 mm).

**Simple Artifacts**

In all 1221 (80.75%) simple artifacts have been collected from all the sites. These have further been in several sub-groups viz. Cores (175: 13.33%), Flakes (273: 19.41%), Flake-blades (100: 8.20%), Core rejuvenation flakes (18: 0.65%), Blades (183: 15.00%), Micro-blades (154: 12.62%), Chips (22: 18.00%), Worked nodules (102: 35%) and Rejects (42 : 3.44%).

(*a*) *Cores* (175 specimens 14.33%)

Taking into consideration the nature of scars these are divided in three sub-groups:

1. Flake cores (85)
2. Blade cores (25)
3. Micro-blade cores (65).

Among the cores there are examples which bear scars all around but some pieces are only partly flaked leaving intact cortex on the remaining portions. Flake cores generally possess scars of different sizes, irregular in nature, but in the case of blade cores and micro-blade cores they are generally regular. Their size ranges between 52×65×52 mm and 10×14×10 mm.

(*a*) *AML-13*: (Fig. 36.3)

It is a flake core made on greenish chert. The flakes of different sizes have been struck off all around the body. The scars over the core are generally thin. A patch of cortex is also seen over the dorsal. Fresh (37×33×28 mm).

*SMG-III-5*: (Fig. 39.1)

A tabular piece of chalcedony was selected for striking off the flakes of various sizes. The scars generally shallow in nature are seen all over the body leaving a patch of cortex. Fresh (39×37×33 mm).

*BSR-45*: (Fig. 39.5)

It is a small round core of chalcedony. Both the surfaces are flaked showing centrally directed shallow flake scars. Fresh (24×23×7 mm).

(*b*) *BSR-4*: (Fig. 39.4)

It is a core of chalcedony out of which several blades and a few flakes have been struck off. Scars are generally shallow and directed towards distal end.

*AML-19*: (Fig. 36.1)

It is a blade core on chalcedony nodule. A number of blades have taken out alongwith some irregular flakes. A little cortex remains on the core. Fresh (45×37×35 mm).

*BSR-19*: (Fig. 36.3)

A multi coloured chert nodule has been employed for striking off the blades. Several blades both of broad and narrow in size have been removed on the upper

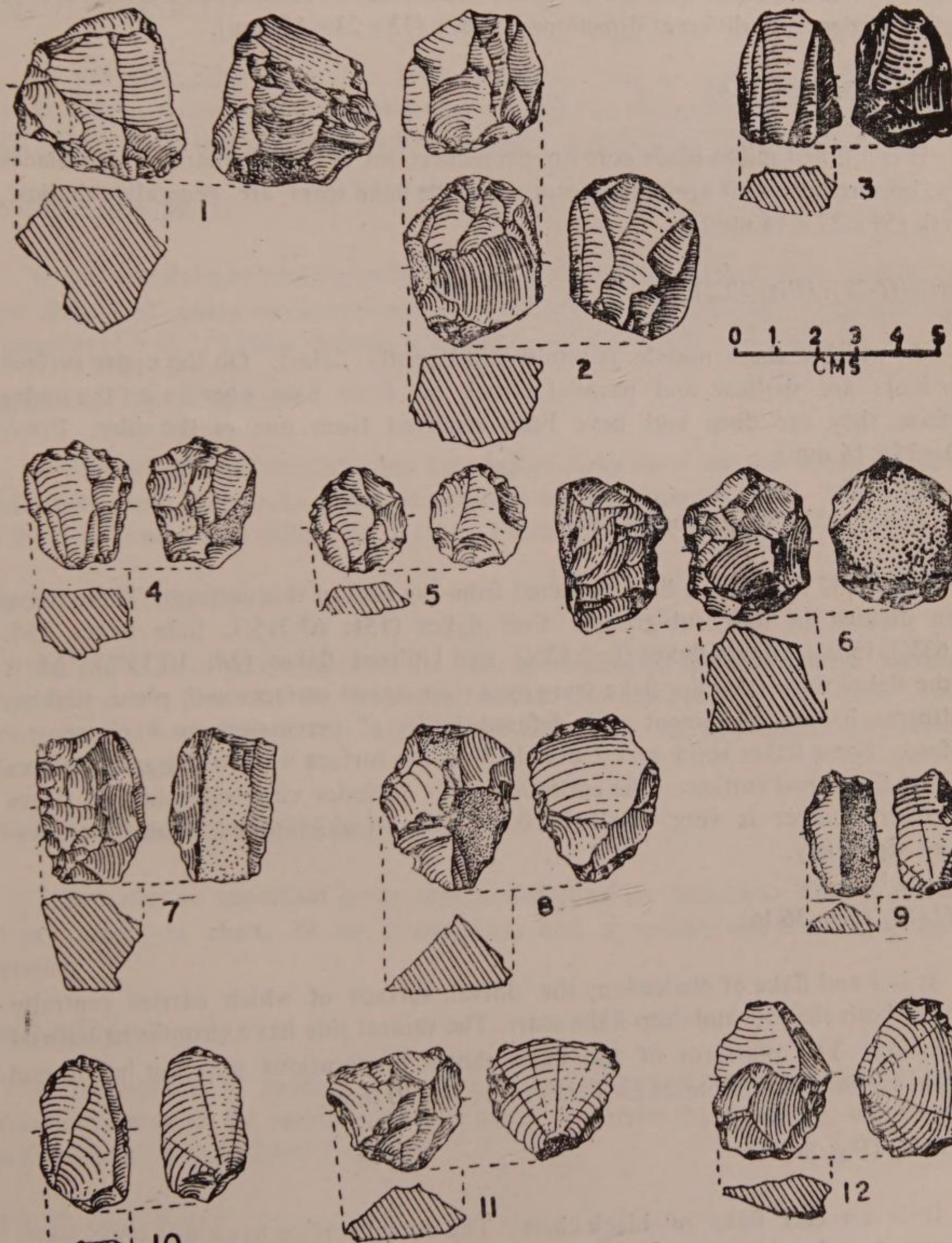



Fig. 39. Upper Palaeolithic Tools

surface in one direction whereas the under surface shows removal of a few flakes as well as blades from different directions. Fresh (32×23×13 mm).

(*c*) *AML-8*: (Fig. 36.4)

It is a fluted micro-blade core on green chert out of which many micro-blades have been removed all around. Except a few the flake scars are generally shallow. Fresh (59×27×14 mm).

*SMG-III-286*: (Fig. 39.2)

A whitish chert nodule is multi-directionally flaked. On the upper surface the scars are shallow and parallel struck off from base whereas on the under surface, they are deep and have been removed from one of the sides. Fresh (30×25×16 mm).

(*b*) *Flakes*: (237 Specimens 19.41%)

In all 237 flakes have been collected from the sites of this culture. These have been divided in four sub-groups: End flakes (151: 63.71%), Side flakes (56: 23.63%), Indeterminate flakes (6: 2.53%), and Utilized flakes (24: 10.13%). Most of the flakes show irregular flake scars over their dorsal surfaces with plain striking platforms having prominent and defused bulbs of percussion on their ventral surface. Some flakes show cortex over half of the surface while a few retain cortex all over the dorsal surface. The collection also includes core rejuvenation flakes but their number is very small (18: 0.65%) due to which they have not been described separately.

*AML-18*: (Fig. 36.16)

It is a end flake of chalcedony the dorsal surface of which carries centrally directed both shallow and deep flake scars. The ventral side has a prominent bulb of percussion. The platform of the flake shows preparations and the left dorsal margin carries battering marks. Fresh (49×37×10 mm).

*AML-86*: (Fig. 36.15)

It is an end flake of black chert. The dorsal surface has a mid ridge while the ventral surface is plain. The right dorsal margin has battered edges and cortex platform. Fresh (33×22×6 mm).

*AML-17*: (Fig. 36.17)

A sub triangular flake has been detached from a chert core. The dorsal surface retains a few deep and shallow scars along the right margin and at distal end. The ventral side is a primary flake surface. Fresh (44×36×10 mm).

*BSR-103*: (Fig. 39.11)

It is a side-flake of whitish chert. The flake shows the characteristic of levalloision flake and bears small centrally directed flake scars on the dorsal surface and a prominent bulb but plain striking platform. Fresh (28×32×12 mm).

*SMG-III-59*: (Fig. 38.12)

A thin side-flake of reddish chert has shallow flake scars on the upper surface and a prominent bulb and a prepared platform on the opposite side. The margin at the distal end shows utilization marks. Fresh (28×38×10 mm).

*SMG-III-118*: (Fig. 39.8)

An end-flake of yellowish chert has flake scars directed towards centre leaving two small cortex patches. On the ventral surface it is chipped at the bulb. The flake bears battering marks all around indicating its utilization. Patinated (40×32×19 mm).

(*c*) *Flake-blades*: (100 specimens: 8.20%)

This is also an important group represented at all the localities. Out of which 60 are made on chert, 39 on chalcedony, and a solitary one is on the quartz material.

*SMG-III-163* (Fig. 39.9)

A flake-blade of reddish chert has a mid ridge and cortex over half of the dorsal surface while the ventral surface is plain. It carries the battering marks at the distal end. Fresh (29×17×6 mm).

*BSR-50*: (Fig. 39.10)

It is a thin flake-blade of whitish chert. The upper surface of it possesses some longer shallow scars whereas the under surface is a primary flake surface. Fresh (36×20×7 mm).

(*d*) *Unworked blades* (183 specimens: 15.00%)

This group consists of those blades which lack intentional working on them. Such blades commonly occur in Chalcolithic industries and invariably they are accompanied by crested ridge. The crested ridge blades are only a few in the present collection. The unworked blades have been divided in four categories:

(a) Complete blades (100)
(b) Broken blades (56)
(c) Utilized blades (12)
(d) Blades with crested ridge (15).

These are represented from all the sites while utilized blades are absent at Amlidih.

*BSR-257*: (Fig. 38.3)

A simple blade on yellowish chert which carries some shallow scars and a small cortex on the dorsal surface, whereas ventral surface retains prominent bulb and a small bulbar scar. Fresh (51 × 21 × 8 mm).

*BSR-255* : (Fig. 38.4)

It is a simple blade on reddish chert. Along the dorsal right margin it bears a few shallow scars whereas on left side the blade retains intact cortex. The ventral side has a prominent bulb at the proximal end. Fresh (68 × 19 × 9 mm).

*SMG-IV-23* : (Fig. 28.2)

A parallel sided blade of chalcedony retains shallow scars on both the surfaces which are larger on the dorsal side and smaller on the ventral. The blade also carries utilization marks along the margins. Fresh (52 × 21 × 11 mm).

*BSR-223* : (Fig. 38.5)

It is a blade with crested guided ridge and the scars all over the blade leaving a small cortex at the end. Fresh (45 × 13 × 11 mm).

(e) *Unworked micro-blades* (154 specimens : 12.62)

These have been divided in several groups such as :

1. Complete micro-blades (80 : 51.95%)
2. Broken micro-blades (66 : 42.84%)
3. Utilized micro-blades (8 : 5.19%)

Except at Amlidih all the sites yield good number of micro-blades. At Amlidih there is only one example of this group.

*SMG-III-169* : (Fig. 38.15)

It is a simple micro-blade on greenish chert. The dorsal surface has a crested ridge and a patch of cortex along left margin whereas ventral surface bears a prominent bulb. Fresh (31 × 11 × 3 mm).

*BSR-238* : (Fig. 38.14)

A blade struck out of yellowish chert core. The dorsal surface has some shallow scars whereas ventral surface is plain with a defused bulb of percussion. The blade shows utilization marks along the margins. Fresh (20 × 10 × 6 mm).

(f) *Chips* (220 specimens : 18.00%)

Some irregular pieces such as chips have also been found. These are present at all the sites.

(g) *Worked Nodules* (102 specimens : 8.35%)

Nodules are extensively used in Middle Palaeolithic industries. Their occurrence in Upper Palaeolithic industry shows the continuance of this earlier tradition. These also have been represented from all the sites.

(h) *Rejects* (42 specimens : 3.44%)

These pieces do not show any working. Such pieces have been collected from Simga-III especially from that part where grid has been applied for total collection. Attempts were made, but without success, to assemble the rejects adjoining the finished tools and cores but a complete original form of the core could not be made out. The broken chips seem to have been widely scattered.

## DISCUSSION

In this section I have attempted evaluation of the Upper Palaeolithic industry of Upper Mahanadi with comparable industries discovered elsewhere in India. I

had the occasion to handle several of these collections in the museums. But those which I could not study first hand I have relied on their published reports. In the Upper Palaeolithic industries of India Dr. M.L.K. Murty has worked out three divisions on the basis of the proportion of flake, blade, and burin elements as : (a) flake blade industry, (b) blade tool industry and (c) blade and burin industry (Murty, 1979 : 301-320).

The Upper Palaeolithic culture has been very well represented in the upper Mahanadi valley. Techno-typologically, it shows an advanced stage from those of Middle Palaeolithic. Stratigraphically it occurs in the Gravel-II at a higher elevation. According to Dr. Murty's classification this culture of Mahanadi falls under the 'blade and burin' group but shows slightly different typological features. To bring out this difference the industry has been divided into two phases :

*Phase A* : The sites of this phase lie over gravel-II and the tools are cruder in nature.

*Phase B* : The sites of this phase are found over the flood plain as scatters and contain typologically somewhat advanced forms than those of the Phase A. Some of the tools are of microlithic size.

The blade and burin forms also occur in the Middle Palaeolithic as well as in the Mesolithic industries. As regards blades, they are found at all the stages of the palaeolithic including the Lower Palaeolithic and Mesolithic industries and do not necessarily become characteristic element in the Upper Palaeolithic industries (Misra 1980). The burins are generally small in number made mostly on fluted cores while those fashioned on flakes and blades are often less in number. Other tool types viz. borers, points and scrapers occurring in the Upper Palaeolithic industries sometimes show close correspondence with the industries of the Middle Palaeolithic (Joshi and Pappu 1978 ; 86-91).

Various types of scrapers have been found in the present collection. A number of them are concave scrapers which is quite significant because generally they are considered as a characteristic type of the Middle Palaeolithic industries. Perhaps it indicates that the tradition of manufacturing concave scrapers was continued even during the Upper Palaeolithic times (Fig. 40). Functionally such scrapers are used for smoothening arrow shafts and perhaps this is an indication of the use of advanced stage in hunting economy. The occurrence of fairly large number of concave scrapers in the Upper Palaeolithic of the Mahanadi further supports the continuation of Middle Palaeolithic ways of life.

In this culture the burins are 10.32%. This group does not show large variety in types. They are made on cores, flakes and blades. The points in this collection

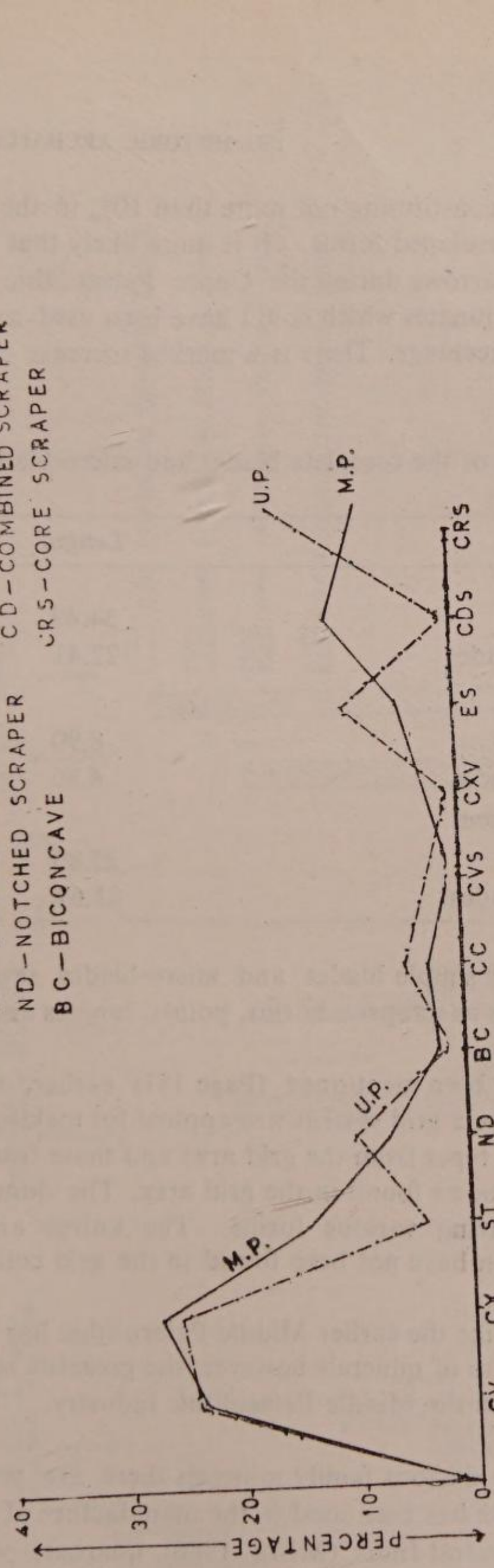



Fig. 40. Distribution of Middle and Upper Palaeolithic scrapers

are less prominent constituting not more than 10% in the finished tools and they do not have well developed forms. It is quite likely that bone points might have been made use for arrows during the Upper Palaeolithic times instead of stone-tipped points. The lunates which could have been used as transverse arrow heads have a very low percentage. There is a marked increase in the number of blades (Fig. 41).

Various values of the complete blades and micro-blades are given below :

| *Mean* | *Length* | *Breadth* | *Thickness* |
|---|---|---|---|
| Complete blades | 34.49 | 15.01 | 7.92 |
| Complete micro-blades | 22.41 | 9.18 | 4.58 |
| *Standard deviation* | | | |
| Complete blades | 8.90 | 2.49 | 2.17 |
| Complete micro-blades | 4.86 | 1.89 | 1.46 |
| *Coefficient of variation* | | | |
| Complete blades | 25.80 | 16.61 | 27.42 |
| Complete micro-blades | 21.67 | 20.56 | 31.92 |

Apart from the simple blades and micro-blades several of them have been converted into tools as scrapers, burins, points, lunates and backed implements.

As has already been mentioned (Page 181) earlier, to determine the correct nature of this culture a grid system was applied for making total collection of the artifacts. The tool types from the grid area and those from random collections are more or less the same as found in the grid area. The dominant tool type continued to be the scraper having various forms. The knives and choppers obtained in the surface collection have not been found in the grid collection. (Table 19).

This industry, like the earlier Middle Palaeolithic has been fashioned dominantly on the silica group of minerals however, the greenish chert pieces are more in number than those in the Middle Palaeolithic industry.

Apart from the silicious family minerals there are several sites in Peninsular India where quartzite has been used in the manufacture of Upper Palaeolithic tools. At Bhimbetka in Central India (Misra 1980) quartzite was used throughout the Palaeolithic period. Only in the Mesolithic culture there was change in raw material Upper Palaeolithic tools from Bariari in Uttar Pradesh are also made on the quartzite (IAR 1955-56 : 4). In Bihar Porcilinitic rock has been used for making

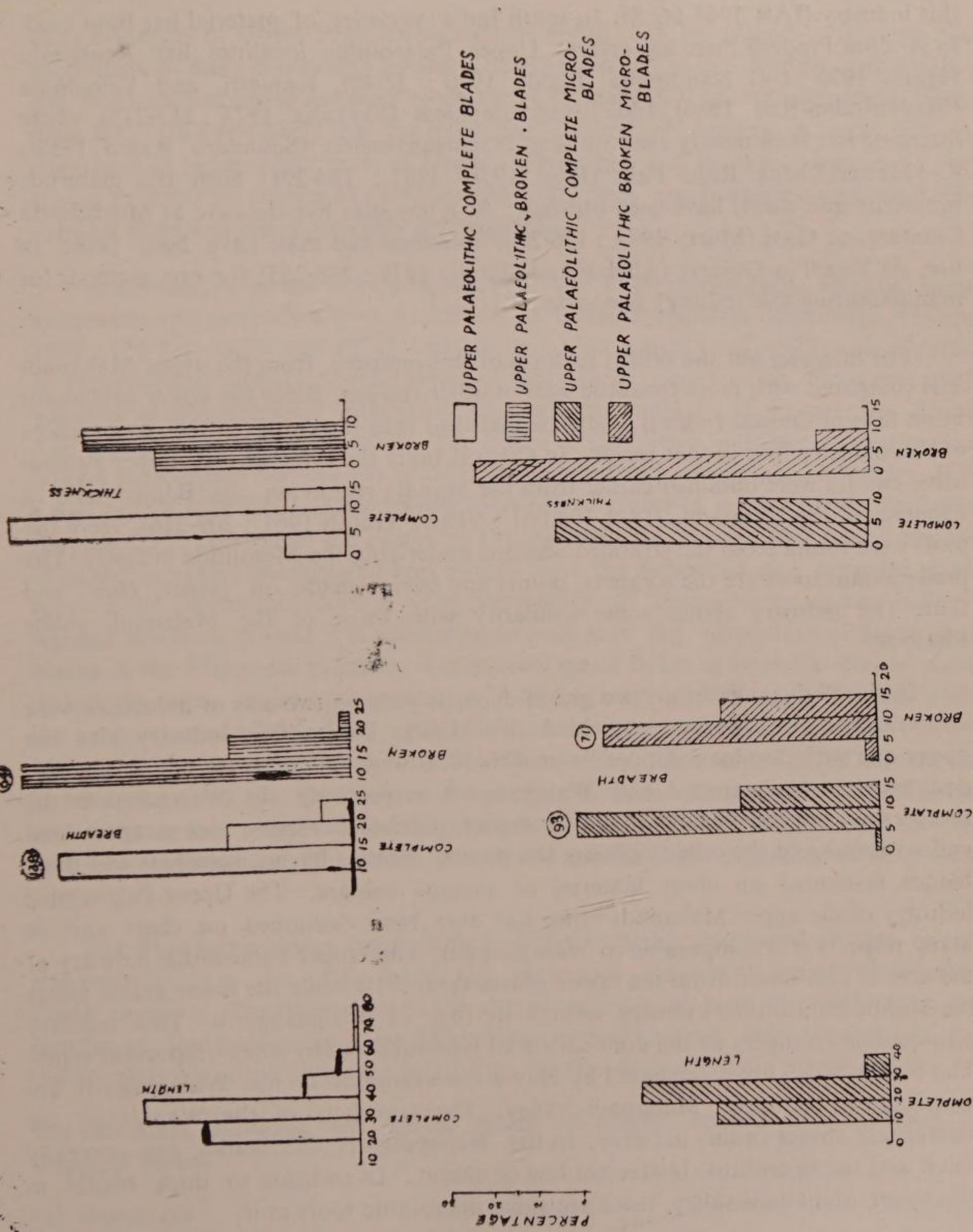



Fig. 41. Upper Palaeolithic blades and micro blades : Frequency distribution of length, breadth and thickness

this industry (IAR 1965-66: 8). In south India varieties of material has been used. In Andhra Pradesh there are several Upper Palaeolithic localities like Renigunta (Murty 1970 : 1-4), Nandipalle (Reddy 1970 : 32-40), Kanigiri, and Veligondla (Madhusudan Rao 1980) and Erragondapalem (Sankalia 1974 : 213-215) where quartzite has been mostly used while at Nagarjunakonda (Soundara Rajan 1958 : 49-113) and Pedda Raju Palli (Raju 1978, 1981 : 184-298) both the materials (quartzite and chert) have been utilized. At a few sites like the cave at Muchchatla Chintamanu Gavi (Murty 1974 : 196-230) limestone and shale have been taken in use. At Visadi in Gujarat (Allchin and Goudie 1971 : 248-265) the raw material for manufacturing this industry is quartz.

For bringing out the salient features of this industry from the upper Mahanadi it is compared with those from the sites of other regions. Since the upper Mahanadi basin falls in Central India it would be useful to take review of earlier occurrences of this industry first in that region. In Central India the evidences of upper Palaeolithic culture were obtained earlier from the Mandla region on the Banjer river a tributary of the Narmada. (IAR 1960-61 : 60 and Ghosh 1961 : 209-216). Here the tools were found from the stratified sections underlying the Mesolithic industry. The predominant tools are the scrapers, points and burins made on jasper, chert and flint. The industry shows some similarity with those of the Mahanadi valley Phase A.

In the Wainganga basin two gravel deposits yielding two sets of industries were encountered. The lower gravel yielded the Middle Palaeolithic industry and the upper one with dominant Upper Palaeolithic features. These two industries were designated as Wainganga-A and Wainganga-B respectively. In Wainganga-B the scrapers are the conspicuous (hollow scrapers, notched scrapers, side-scrapers and end-scrapers) and the other tools are the points, borers, burins, tranchets and thick blades fashioned on chert material of various colours. The Upper Palaeolithic industry of the upper Mahanadi valley has also been fashioned on chert and in many respects it is comparable to Wainganga-B. The Upper Palaeolithic industry of the area is also found from the upper gravel (gravel-II) while the lower gravel yields the Middle Palaeolithic industry similar to that of Wainganga-A. This industry also contains scrapers as the dominant tool type followed by other important types. The burins which are represented by only a few examples in the Wainganga-B are significant in the upper Mahanadi valley. The tranchets of the Wainganga are completely absent in this industry. In the Wainganga-B the blades are generally thick and the microlithic blades are few or absent. In addition to thick blades in the upper Mahanadi valley, there are some microlithic tools in it.

At Adamgarh rock shelters in Hoshangabad a cultural sequence right from the Lower Palaeolithic to Mesolithic has been obtained (Joshi 1978 : 10-78) but here the

clear evidences of Upper Palaeolithic culture could not be traced. However, the proportion of flake-blades and blades is quite significant in the Middle Palaeolithic due to which this phase has been compared with those of the Wainganga-B. (Ibid, page 36). It is quite likely that the habitational debris at Adamgarh rock shelters contained an independent layer of Upper Palaeolithic but as the existence of the Upper Palaeolithic culture at that time (1961-62) was not properly understood this cultural stage was not thoroughly investigated.

In the vicinity of the Narmada, not very far from Adamgarh, recently most systematic and methodically excavated site in Central India is Bhimbetka (Misra 1977 : 130-171, 1978a and 1978b : 63-106 and 1980 Misra *et al* 1977) also situated in Hoshangabad district. Here a series of rock shelters and caves have preserved varieties of arehaeological antiquities. In rock shelter-III F. 33. a complete Stone Age sequence has been met with. The Upper Palaeolithic industry is present in layer 4 sandwiched between the Middle Palaeolithic and Mesolithic industries. It is a dull brown silty clay horizon having thickness of about 15 cm varying in thickness between 15-20 cms. Hcre the excavator (Misra 1980) has noticed that the percentage of blades increases steadily and appreciably from the Acheulian and becomes maximum in the Mesolithic culture (The percentage of micro-blades is also higher). Against this back-ground it is interesting to note that the percentage of flakes and blades in the Mahanadi industry. The percentage of flakes at both the sites is more or less the same. In the Mahanadi it is 22.79% against 26.80% at Bhimbetka while the proportion of blades show a great difference between the two. The blades in the Mahanadi area are 13.47% while at Bhimbetka they are only 4.28%. It should however, be noted that the Mahanadi collection is from the surface or open station and is not in that respect the total collection as at Bhimbetka caves. Due to this fact the percentage of chips and cores also exhibit slight difference at both these sites.

The Bhimbetka Upper Palaeolithic industry is mainly fashioned on the quartzite material. On the other hand the Mahanadi industry is mainly on silicious family minerals. The differences of the size of the tools of both the industries are significant. For finding out these differences metrical analysis was carried out for the comparison of the various values of the blades. A few of these are as under :

**The maximum, minimum and mean values of length, breadth and thickness of complete blades.**

| | | *Length* | *Breadth* | *Thickness* |
|---|---|---|---|---|
| (a) *Bhimbetka* | | | | |
| (7) | Maximum | 85 | 34 | 19 |
| | Minimum | 42 | 20 | 7 |
| | Mean | 62 | 26 | 12 |

| | | *Length* | *Breadth* | *Thickness* |
|---|---|---|---|---|
| (b) Mahanadi | | | | |
| (138) | Maximum | 77 | 23 | 13 |
| | Minimum | 24 | 12 | 4 |
| | Mean | 34 | 15 | 8 |

It is seen that the number of broken blades is equally high in both the industries. These pieces do not correctly represent all the dimensions as they are broken along their length but the values of breadth and thickness remain consistant. So they have also been taken for comparison.

**Mean values of breadth and thickness of broken blades**

| | *Breadth* | *Thickness* |
|---|---|---|
| (a) Bhimbetka (73) | 22 | 9 |
| (b) Mahanadi (64) | 14 | 6 |

The above figures show that all the values in cases of chert blades from the upper Mahanadi are lesser than those of the quartzite blades of the Bhimbetka.

The micro-blades (12 mm in breadth) have also been found at all the levels at Bhimbetka (Misra 1980) but their number is more only in Upper Palaeolithic and Mesolithic levels. In the Mahanadi valley, along with the Upper Palaeolithic tools micro-blades have also been found. Below are given the mean of breadth and thickness of Bhimbetka and Mahanadi micro-blades.

| | | *Breadth* | *Thickness* |
|---|---|---|---|
| (a) | Bhimbetka (22) | 19 | 7 |
| (b) | Mahanadi (93) | 9 | 4 |

Thus in the micro-blades from Upper Palaeolithic levels at Bhimbetka, the values are higher than those of the Mahanadi valley. Perhaps the raw material has influenced the size of the tools.

The existence of the Upper Palaeolithic was brought to light in Maharashtra by K.R.U. Todd as early as 1939 in the stratigraphical context at Khandivali region of Bombay (Todd 1939 : 257-272). Later on the evidences of this culture were also obtained from Nevasa on Pravara (Sankalia 1956 : 35-52), and at Bhadne and

Ghod river (Sali 1967 : 157-167; Kajale *et al* 1976 : 122-32). Some of the surficial occurrences are from Papamiya-Tekdi in Chanda district (IAR-1961-62 : 22-24) and Dhavalpuri in Ahmednagar district (Sankalia 1974 : 207-230). Recently several sites have been brought to light by the excavations and explorations in the different parts of Maharashtra and have yielded not only the firm evidences of this culture but also its gradual evolution from the Middle Palaeolithic to Mesolithic.

At Patne, on the Tapti basin in Maharashtra, the excavated trenches yielded 10 sub-cultural phases starting from Middle Palaeolithic to the Mesolithic (Sali 1980 : 75-81). This comparative study of these cultures with those from Mahanadi is intended to examine whether there is any effect of regional environment on these cultures from north and south.

The cultural deposit at Patne is about 10 m. of which the lowermost horizon consists of 1.50 m. and it unconformably rests over the weathered basalt. The advanced Middle Palaeolithic tools have been found from the earliest cultural horizon composed of reddish sandy gravel. The total collection including the debitage (181) consists of 254 specimens. The maximum number of tools found are the scrapers (21), while burins and points are represented by (4) specimens each. Borers are only 2 and simple and retouched blades are 15. Apart from these regular tool types, the flakes constitute fairly large number (20). Due to dominance of flake elements and scrapers, smaller size of the tools than those of the Middle Palaeolithic, and the presence of a few Upper Palaeolithic characters in it, the writer has called this industry as Advanced Middle Palaeolithic and has compared it with Wainganga-B industry of Central India. The raw material employed for this industry is mostly jasper (82.19%) while others like blood agate (15.07) and chalcedony are very few. This industry shows characters of Upper Palaeolithic as is evident by the presence of large number of blades and presence of burins on cores as well as on flakes. Although the raw material at Patne is different (jasper) from that in upper Mahanadi (chert), techno-typolog cally this phase of Patne is comparable to that of Mahanadi Phase A. It should however, be mentioned that some of the types like choppers knives etc. found in the Mahanadi collection are not present at Patne.

In the period II at Patne the true Upper Palaeolithic phase has been represented and is divided into 5 sub-phases (II A,B,C,D and E). These phases have further been put in two broad groups : Early Upper Palaeolithic (II ABC) and Late Upper Palaeolithic (II D and E) on the basis of difference in raw-material, size of the tools and various tool types. In the early phase jasper is dominant raw material whereas in the later phase it is the chalcedony. Regarding the distribution of the artifacts from Patne excavation it is seen that in the various phases of period II, the blades and blade tools become dominant instead of flakes and flake tools. Borers and

Burins have been found at all the stages. Points are few and the scrapers gradually increase in the later phases. Geometric forms such as triangles and trapezes are present only in II E. In the Phase B of the Mahanadi the scrapers are dominant and burins and points have been represented more or less in equal proportions. The occurrence of lunates are worth mentioning but the triangles and trapezes are totally absent. The dominance of blades, less percentage of scrapers, and presence of geometric forms in the excavated material of Patne show typologically advanced stage than that of the upper Mahanadi Phase B. It should however be mentioned that Mahanadi collection is from the surface.

An Upper Palaeolithic workshop centre was discovered on the hill slopes at Bhokar, Nanded district, Maharashtra (Joshi and Pappu 1979 : 86-91). Here the dominant tool type is the scraper while borers, burins, points, and knives are the other tools found at this locality. The blades and flake-blades are also present. The blades are generally thicker than those of the Mesolithic blades which generally comprise the simple blades and marginally retouched blades. Some of the blades are retouched into scrapers. A few tools like tranchet are also present in the collection. According to the authors this industry, to a certain extent, is comparable to Wainganga B. The Bhokar and the Mahanadi Phase-A industries are fashioned on silicious family minerals and typologically bear no different characteristics, only the types like tranchet are absent in the Mahanadi valley.

Another Upper Palaeolithic site has recently been discovered at Naikund on the Pench river a tributary of the Kanhan, Nagpur district, Maharashtra (Pandey 1980 : 223-230). The tools at this site have been found *in situ* in the river gravel section as well as on both the banks of the river. They are made on silica group minerals. Here again the scrapers are maximum in number among the shaped tools. The other tool types are the borers, points, burins, knives, blades, micro-blades and choppers. More or less the same tool types are found in the upper Mahanadi valley, backed pieces are few. The site shows the presence of microlithic elements which suggests a complete development of this culture in the area as the artifacts comparable to Wainganga-B have been found here. This site shows a great affinity with that of the Mahanadi regarding raw material and situation of the sites. The graphic representation of the tools of both the sites is given (Fig. 42).

In Shorapur Doab, Karnataka, a complete stone age cultural sequence has been obtained in stratigraphic context on the Hunsgi Nala. At Meralbhavi (Locality 2 and 3) Gulbal, Benhatti and Hunsgi an exclusive blade tool industry has been found from a stratum of loose pebbly granular gravel having thickness of about 10″ occupying an intermediatory position between the Middle Palaeolithic and Mesolithic (Paddayya 1970 : 165-190). This industry is mainly on the blades of

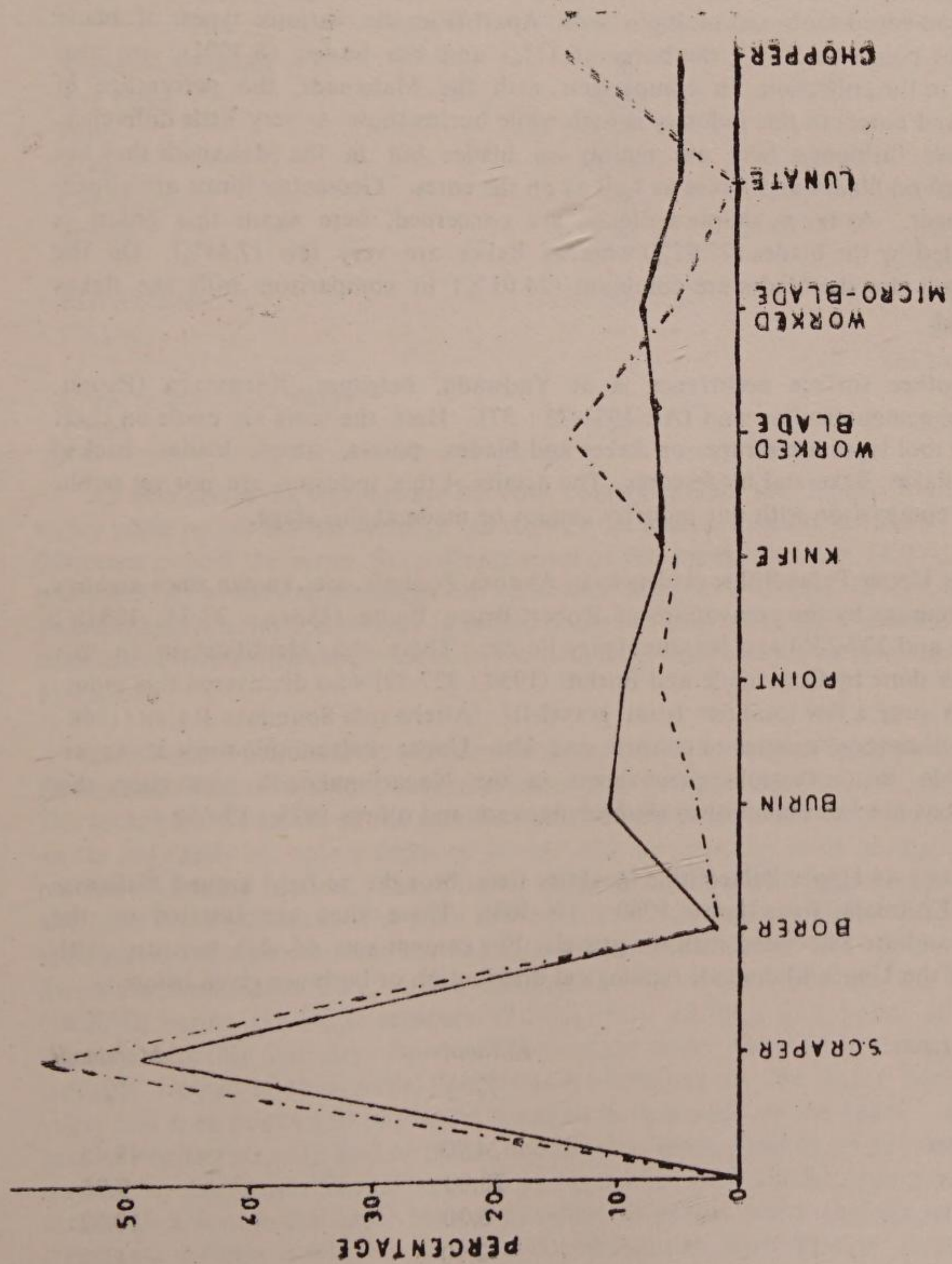



Fig. 42. Distribution of the Shaped tools in Mahanadi and Naikund Upper Palaeolithic industries

chert material of various colours. The tools are divided into three categories: edged tools, non-edged tools and multiple tools. Apart from the various types of blade tools, the points (16.31%), the borers (6.11%) and the burins (8.39%), are also present in the collection. In comparison with the Mahanadi, the percentage of points and borers in this industry is high while burins show a very little difference. The tools fashioned here are mainly on blades but in the Mahanadi they are fashioned on blades and flakes as well as on the cores. Geometric forms are altogether absent. As far as simple artifacts are concerned, here again this group is dominated by the blades (77.95%) whereas flakes are very few (7.44%). On the Mahanadi also the blades are dominant (24.01%) in comparison with the flakes (22.79%).

Another surface occurrence is at Yadwada, Belgaum, Karnataka (Pappu. Personal communication and IAR 1971-72 : 37). Here the tools are made on chert and the tool types are scraper on flakes and blades, points, simple blades, backed blades, flakes, flake and blade cores. The details of this industry are not yet published so comparison with our industry cannot be made at this stage.

The Upper Palaeolithic evidences in Andhra Pradesh are known since eighties of last century by the excavations of Robert Bruce Foote (1884a : 27-34, 1884b : 200-208 and 227-235) and his son Henry Foote: Their clear identification in this area was done by Commiade and Burkitt (1930 : 327-39) who discovered this industry from quite a few localities from gravel-III. Afterwards Soundara Rajan (1958 : 49-113) discovered a series of cultures and also Upper Palaeolithic tools at Nagarjunakonda. But in the subsequent report on the Nagarjunakonda excavation this culture has not been mentioned (Subrahmanyam and others 1975 : 19-65).

Nearly 44 Upper Palaeolithic localities were brought to light around Nallamalai and Erramalai areas (Issac 1960 : 176-304). These sites are situated on the surface and are associated with the gravels. For comparison of this industry with those of the Upper Mahanadi typological distribution of both are given below :

| *Tool types* | *Kurnool* % | *Mahanadi* % |
|---|---|---|
| Scrapers | 24.90 | 48.45 |
| Points | 28.00 | 9.96 |
| Burins | 6.30 | 10.32 |
| Borers | 2.90 | 1.72 |
| Knives | — | 6.18 |
| Cresentic forms | 1.53 | 4.47 |

| *Tool types* | *Kurnool* % | *Mahanadi* % |
|---|---|---|
| Trapezoidal forms | 3.00 | — |
| Axe types | 4.00 | — |
| Picks | 0.91 | — |
| Awls | 0.78 | — |
| Choppers | — | 4.47 |
| Blades | 22.40 | 25.09 (of total) |
| Flake-blades | 3.80 | 8.20 |
| Flakes | — | 22.79 (of total) |
| Cores rejuvenation flakes | — | 0.65 |
| Cores | 2.90 | 14.33 |

As seen above the scrapers are the chief components in the Upper Mahanadi valley while points are less (9.96%). As regards the blades, they do not show much difference in both the areas. Surprisingly some of the types like axe (4.00%) and picks (0.91%) which are present in this collection are rarely found in the Upper Palaeolithic collections elsewhere in India. Some of the microlithic elements like trapezoidal forms which are present in Kurnool area are totally absent in the upper Mahanadi.

Blade and burin industry has been encountered from various localities around Renigunta, Chittoor district, Andhra Pradesh (Murty 1969 : 83-101; 1970 : 106-128) The tools here are found on the ancient aggradational plain of the river Rallakalava on the red sandy silt upto a depth of 20 cm and on creamy white concretionary patches on eroded surfaces. The material of this industry is fine grained quartzite and little black lydianite. The main components of this industry are the blades and tools fashioned on them while the flakes or flake, tools are rare. The backed implements are dominant (67.30%) in the collection while other types are the blades (19.30%), burins (16.24%), scrapers (7.56%), awls (3.70%) and points (2.00%). Typologically this industry shows differences in many ways with those of our industry. Instead of blade tools, flake tools are dominant in the upper Mahanadi valley and even points and burins are found to be fashioned on the flakes. Among backed implements only backed blades and lunates represented by 19 and 13 pieces respectively are found. The triangles (1) and trapezes (2) of the Renigunta industry are totally absent in the upper Mahanadi valley. Thus this shows that typologically Renigunta industry is relatively more developed industry than that of the Upper Mahanadi valley.

In the Betamcherla area (Kurnool district Andhra Pradesh) 5 open-air find-spots containing Upper Palaeolithic industry have been discovered (Murty and Reddy 1976 : 214-226). The total collection comprises of 150 tools made on lime-stone, quartzite and chert. The blades are 34.66%, flakes are 28.66%. The scrapers are the maximum (11 : 7.33%) among the regular tool types, chisels are 3.33% and burins are only 3 (2.00%). Some of the tools like chisels (3.33%) and perforators (0.70%) are not present in the Mahanadi and the Mahanadi types like points are absent here. But techno-typologically both the industries share many points of agreement with each other.

In Betamcherla area a cave Muchchatla Chintamanu Cave, Kurnool district, was excavated by Murty (1974 : 196-230). It has yielded, bone tools, stone tools and also the late Pleistocene fauna. In the stone tool industry are present flakes (26.00%), blades (41.35%), cores, (5.45%), and chips (27.20%) made on limestone and compact shale. In the raw material and tool types this industry is different from that of the Mahanadi area.

Recently two cave sites namely Kottala Polimera Cave and Billasuragam near Betamcherla Kurnool district, were excavated (Reddy 1981a : 206-227). Both these caves have cultural deposits of 3.50 and 1.50 cm. respectively and have been divided into sub-groups on the basis of archaeological and osteological evidences. The collection is fashioned mainly on quartzite and limestone which has been divided into finished tools (240) and artifacts (1346). Among the finished tools blades are the dominant type (103) while the scrapers are less (48). The other-types are burins (20), points (42), borers (9), arrow heads (11), and knives (7). The Mahanadi industry is fashioned mainly on chert and the scrapers made on flakes, blades and nodules form the dominant group while in Betamcherla they are worked only on flakes. Apart from other types, the Mahanadi collections also include lunates, triangles and choppers while they are absent in the Betamcherla collection. Against this, the arrow heads and the bone tools of Betamcherla are not found in the Mahanadi Upper Palaeolithic industry. Except a few, all the artifact types which occur in the Betamcherla are also found in the Mahanadi area.

An industry on dull red coloured chert has been found at Vemula in Cudappah basin (Reddy 1970 : 227-234). This is a surficial occurrence. The collection includes 177 specimens of which 67 are the shaped tools and remaining 86 are the simple artifacts. More or less the same technique as has been employed in Middle Palaeo-lithic industries is seen in this collection also. The faceted platforms are prominent in case of flake-blades while they are less common in the flakes. The writer has designated it as 'Vemula industry' and he is of the opinion that 'Vemula industry' shows an improved technique of manufacture from that of the Middle Palaeolithic.

The blade element in Vemula industry is higher in comparison to the earlier industry. The sizes of the tools have statistically been worked out and show an intermediatary stage between Middle Palaeolithic and Mesolithic. The tools are fashioned on the flakes, flake-blades and include various types of scrapers, borers, points and knives including flakes, flake cores and micro-blade cores. Typologically this industry has close similarity with Mahanadi Phase A.

A cultural sequence from Lower Palaeolithic to Mesolithic has been discovered at Nandipalle in the Sagileru basin, Cuddapah district (Reddy 1978 : 32-40). These industries, excepting Upper Palaeolithic, occur in the stratigraphical position as well as over the surface. The Upper Palaeolithic collection is only from the surface. The Upper Palaeolithic is found from two localities : findspot II and findspot III. At findspot III the tools of this culture are found along with the mesolithic and have been distinguished on the basis of raw material. The tools of Upper Palaeolithic are made on fine and coarse grained quartzite while Mesolithic tools are on milky quartz. In all 624 tools have been found. The scrapers are the dominant group among the finished tools while burins come the next. The other tool types are blunted backed blades, borers, points and knives. As far as simple artifacts are concerned the collection contains simple blades, flake-blades, flake cores and blade cores. Though the dominant element is flakes the proportion of blades and flake-blades is quite significant. The industries however, show difference in the use of raw material although typologically they have a great deal of similarity with each other.

Upper Palaeolithic surface scatters were discovered at Erragondapalem on the ancient alluvium of the river Rallavagu, Markapur taluq, Prakasham district (Sankalia 1974 : 213-219). The site yielded 2129 tools made on fine-grained quartzite. These have been divided in three categories : (a) finished tools, (b) blades, and (c) other categories. Below is given the typological distribution of Erragondapalem and the Mahanadi industries :

| *Tool types* | *Erragondapalem* No. | *Mahanadi* No. |
|---|---|---|
| Scrapers | 285 | 141 |
| Points | 56 | 29 |
| Burins | 24 | 30 |
| Awls | 5 | 5 |
| Backed blunted blades | 62 | 20 |
| Knives | 22 | 18 |
| Choppers | 34 | 13 |
| Lunates | — | 13 |

| *Tool types* | *Erragondapalem* No. | *Mahanadi* No. |
|---|---|---|
| Blades | 120 | 360 |
| Flakes | 250 | 237 |
| Flake-blades | — | 100 |
| Core rejuvenation flakes | 124 | 18 |
| Cores | 191 | 175 |
| Chips | 356 | 220 |
| Worked nodules | — | 102 |
| Rejects | — | 42 |

It is seen that numerically the blades are maximum but among the shaped tools scrapers predominate at Erragondapalem white in the upper Mahanadi also the same typological features have been repeated. The percentage of choppers, points, borers and knives is interesting at both the sites as they do not show much difference. However, there are some types like burins and backed blades which show much difference. A few types such as lunates present in the Mahanadi collection are totally absent at Erragondapalem. It should however, be mentioned that the Upper Palaeolithic assemblages of both the areas are from surface and in that respect are not the total collections.

The potentialities of the Upper Palaeolithic industries have also been brought to light from Bihar state. As early as 1959 the Upper Palaeolithic blades were discovered at Prattappur and Marvania in Palamu district (IAR 1959-60 : 12). These were the surfacial occurrences in the north of Koel valley but the stratified evidences were still lacking in the area. Later on Upper Palaeolithic industry was discovered at Dhekulia again in Palamu district in stratigraphical context. The tool types are the scrapers, points, burins, knives, awls, blades, waste flakes and cores on porcelinate rock. The details of this industry are not published yet except a small report in Indian Archaeology—A Review (1965-66 : 8) as such it is difficult to attempt its comparison with that of Mahanadi area.

Several sites have been reported from the Chandil, Seni, Ghatsila and Jamda areas of Singhbhum district (Ghosh 1970 : 1-68). The stratified river sections of the Subernrekha and Sanjai valleys yielded tools fashioned on agate, jasper, and other silicious rocks. The tools consist of choppers (11.91%), scrapers (53.23%), points (11.91%), knives (1.91%) borers (1.43%), blades (9.05%) and cores (9.52%). It can be seen that this industry is dominated by flake-blade elements and all the types represented here are found in the upper Mahanadi collection.

Recently Upper Palaeolithic industries have for the first been discovered at Selbalgiri and Watri Abri, Garo Hills, Assam. In this area the flake blade assemblage has been found on the terraces of Rangram river. The details of this industry are not yet available, so fruitful comparison with the upper Mahanadi industries is not possible.

G.R. Sharma and his co-workers have found a definite evidence of this industry in the third gravel on the Belan and its major tributary Seoti in Allahabad district, Uttar Pradesh (IAR 1966-67 : 35). Subsequently several sites were found at the foot hills of Belan region (Misra 1977 : IAR 1968-69 : 33). Apart from Belan valley, some evidences of Upper Palaeolithic have also been traced in the Banda district (Pant 1964 : 28). Now several Upper Palaeolithic sites have been located in the southern Uttar Pradesh in Allahabad, Mirzapur and Banda districts.

Several sites have recently been discovered in southern Uttar Pradesh yielding Upper Palaeolithic industries (Pant 1978 and 1980). Among them the important ones are Daiya, Lahariadih, Siddapur, Ainchwara, Kalinger and Lodhwara. In them at Daiya the industry is found *in situ* in the third gravel of Seoti; Lodhwara, from a lowermost stratum of a rock-shelter and Siddhapur from alluvial deposits of the Bankesidha valley, while others are the surface collections. A detailed typological classification has been made of the finished tools. The scrapers form an important group and side scrapers show the common typological feature. Though the burins, borers and points are also present in relation to the burins (6.47%), the points (0.72%) are very few. Proportion of micro blade (bladelets) is larger than that of blades and flakes. Backed pieces like backed-blades, micro-backed blades, and lunates occur frequently. Triangles are rare and trapezes are totally absent. The writer finds the similarity of the collection with those of Patne-II E and D from Maharashtra. The denticulate forms which are one of the most frequent types in the southern Uttar Pradesh are absent in the Mahanadi collection. Typologically the southern Uttar Pradesh industry shows developed forms than those of our collection. Pant (1980 : 6) is of the opinion that "various types of burins, scrapers, borers, points, truncated blades and bladelets which appear in most of these industries, unlike their European counterparts, are generally limited in number.

From the above somewhat exhaustive review of the Upper Palaeolithic culture of different regions of Indian it is observed that besides the differences in different geographical (environment) zones, even within the same geographical area, in places, the cultures show significant variations. This is partly due to differences in raw material and micro-climatic niches as rock shelters or riverine sites etc. On the one hand these industries show close typological relationship with Middle Palaeolithic having advanced forms like Wainganga-B and advanced Middle Palaeolithic

of Patne while on the other hand they show increasing tendency towards microlithisation as at Patne-II D and E and in southern Uttar Pradesh. To some extent there seems to be a sort of continuity of cultural growth from Middle Palaeolithic to Mesolithic through Upper Palaeolithic.

Several dates are available of the pre-Mesolithic and post Middle Palaeolithic industries. They range between 25000-10000 years B.P. (Reddy 1978 ; 32-40, Sali 1980; 204, Agrawal and Kusumgar 1975a : 219-225 and 1975b : 149-151). These dates are supported by fossil evidences—Late Pleistocene at Inamgaon (Kajale *et al* 1976 : 122-32) and Kurnool caves (Murty 1975 : 132-138). Recently in the adjoining areas of the upper Mahanadi valley, an Upper Palaeolithic cultural deposit has been noticed near Dharampuri on the Narmada valley by Smt. Sheela Misra (personal communication) wherein the tools are made on chert and chalcedony and very rarely on quartzite. The radiometric age of the associated fresh water molluscan shells is 25000 years B.P. The age of the Upper Palaeolithic industry of the upper Mahanadi is therefore not likely to be different from that of the other sites found in Central India.

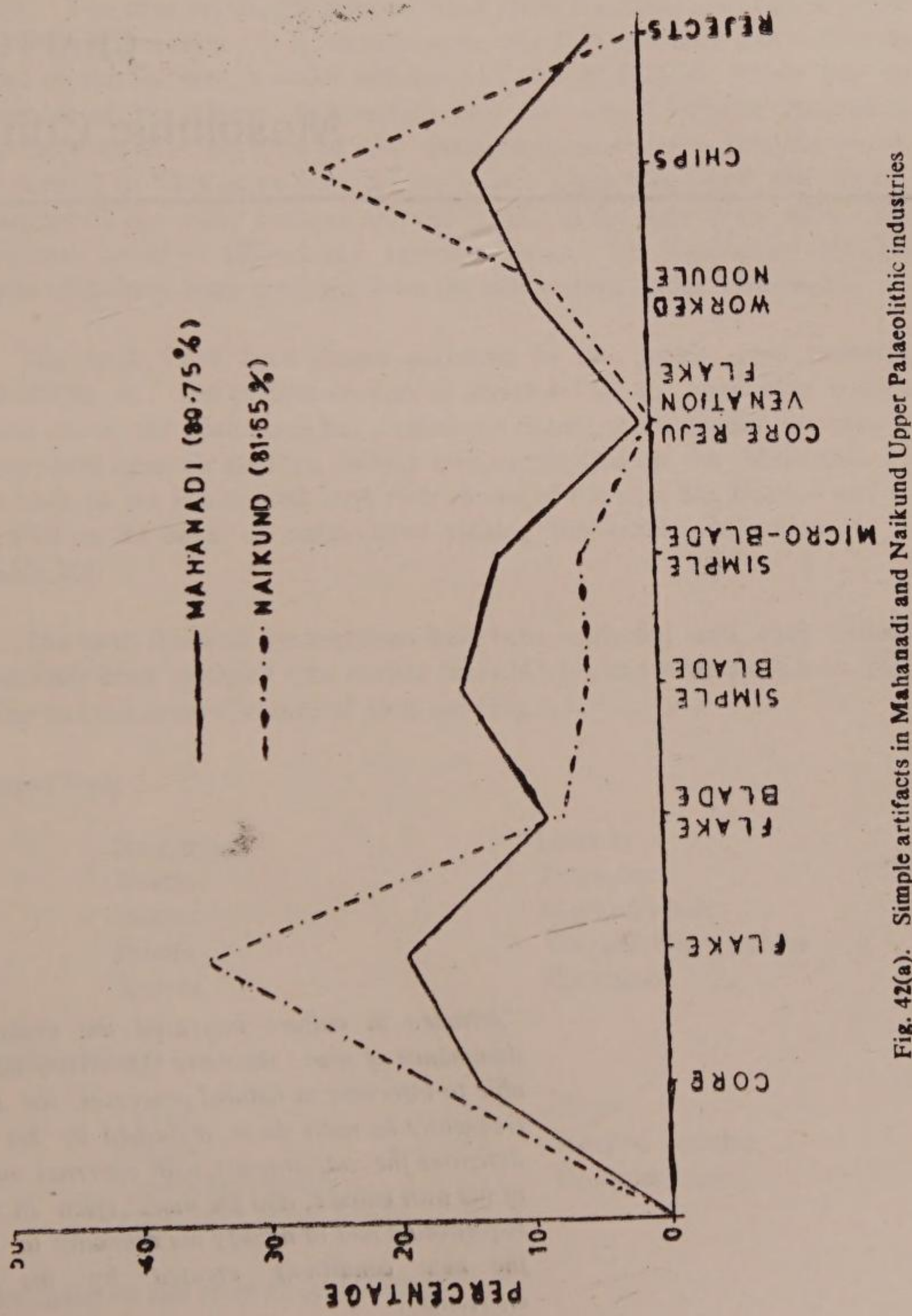



Fig. 42(a). Simple artifacts in Mahanadi and Naikund Upper Palaeolithic industries

CHAPTER 4

# Mesolithic Culture

*"Advance in culture increased the ecological dominance of man : the more effectively he was able to intervene in natural processes, the more frequently he must have disturbed by his own activities the adjustments with external nature of his own culture, and the more often in consequence he had to modify his economy to meet the new conditions created by his own exertions".*

J.G.D. Clark 1952 : 9

This is the most prolific and widely distributed culture in the upper Mahanadi valley. The sites are mostly concentrated along the Mahanadi proper while a few are on the tributaries. It is interesting to note that no site of this culture has been found on the Seonath, a major tributary of the Mahanadi which has given the evidences of the Upper Palaeolithic and the richest Middle Palaeolithic sites. Generally the sites are situated near the permanent water bodies like rivers, but a few occur 6 to 7 km away from the main river along the small dry nalas. Other locations are the rocky surfaces and the slope and the base of the hills. Some sites have been found on alluvial and lateritic plains. At Tanhkapar the Mesolithic *in situ* tools have been obtained from the cliff section of the Mahanadi.

The tools have been found scattered in the larger areas extending upto 200-300 sq. m. The smaller clusters of about 4-5 sq. m. were also common. As stated above, the Mahanadi has yielded the richest concentration of sites. Out of thirty three open air stations, twenty nine are located on the Mahanadi river and two each on the Hasdo and Jonk river. Some of the sites like Hataud and Kaunkera situated on the bank of nalas have yielded the richest collections in the area (Table 20).

The tools from all the locations have been collected and each collection has separately been analysed into shaped tools (17.14) and simple artifacts (82.86%) to bring out the salient feature of each site (Fig. 43).

*Shaped tools* :

Scrapers
Borers
Burins
Points
Knives
Lunates
Triangles
Worked blades
Worked micro-blades
Choppers

*Simple artifacts* :

Cores
Flakes
Unworked Blades
Unworked micro-blades
Chips
Worked nodules
Hammerstones

**Raw material and state of preservation**

Like earlier industries the raw material is cryptocrystalline silica family minerals viz. chert, chalcedony agate, carnelian, quartz and rarely jasper. The

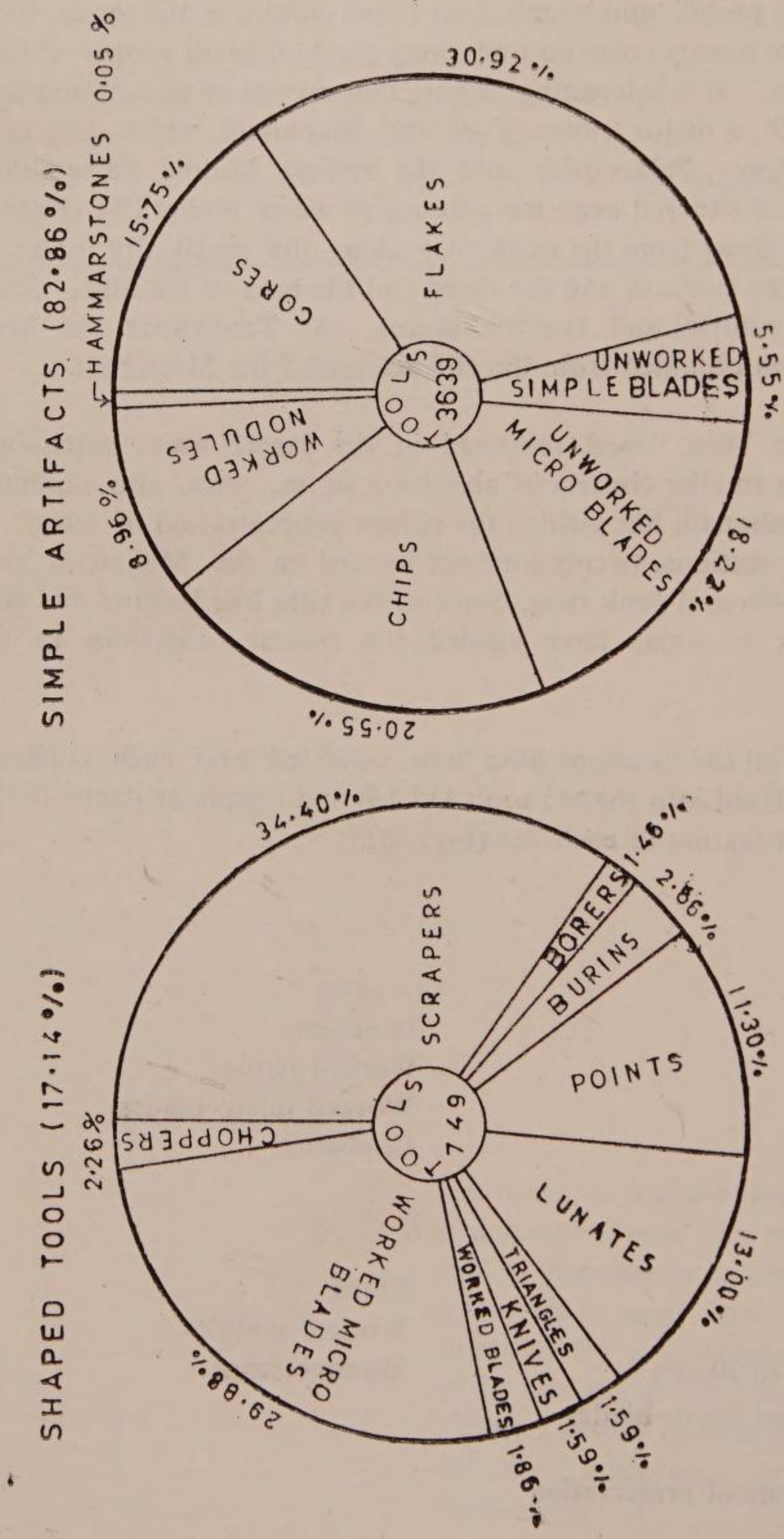



Fig. 43. Mesolithic Tool Types

chert is the most frequently used material in different shades like red, green, yellow, black and sometimes white. The sites located in the quartzitic areas are mainly fashioned on the chert and chalcedony while in the granitic region the quartz is the preferred raw material. At some sites pebbles and pebble choppers of this raw material were found along with the tools which indicate that the pebbles of these minerals were picked up from the river gravels and were used for manufacturing artifacts. At several places quartz veins were seen in the granitic region around the sites. Raw material and its distribution is as follows :

| *Raw material* | *Number of tools* | *Percentage* |
|---|---|---|
| Chert | 2438 | 55.51 |
| Chalcedony | 645 | 14.68 |
| Quartz | 1121 | 25.52 |
| Jasper | 83 | 1.89 |
| Agate | 56 | 1.28 |
| Carnelian | 32 | 0.73 |
| Dolerite | 2 | 0.05 |
| Quartzite | 15 | 0.34 |
| Total | 4392 | 100.00 |

The tools from the sites situated on the rocky surfaces or alluvial and lateritic plains are fresh in the state of preservation and are rarely seen patinated and rolled. These found at the base of the hills and coming from the soil bear whitish and blackish patches over them. A few tools also show dull appearance due to exposure for a long time.

**Technology**

The Mesolithic industry is worked on blades flakes and nodules of various sizes. The flakes and blades of different shapes and sizes have been struck off from varieties of cores. A few cores especially the fluted cores indicate that the blades have been removed from directions either from one end and side, or from both the ends. The flake cores generally show irregular scars. A few small cores have roughly round shape having centrally directed scars indicating that they were properly prepared before knocking off the flakes. Some cores in the present collection are partly flaked. The blades and flakes have been removed either by soft hammer like bone or wood, by punch, or pressure technique.

Several flakes and blades have further been worked by various kinds of retouch and converted into tools. The micro-lithic industry of this region is

aceramic and consists of semi-geometric forms like lunates and triangles but the trapezes are completely absent. Backed blunted blades also deserve particular mention as these tools have blunted back prepared both by unifacial and bifacial working. The flake tools and the tools made on nodules like scrapers, borers and points generally have very fine unifacial retouch. Some of the core scrapers have very sharp edges at their base and could have served as core-scrapers. Burins have been produced by removal of spalls while choppers are of bifacial variety. In general the tools in this collection have fine and delicate working.

**Typology and description of illustrated tools**

*Shaped tools* :

The shaped tools are present at all the sites but Hataud, Kaunkera and Bagar have yielded the maximum number of tools of this category. Some sites like Ponr, Bhilai and Araud have given only a few tools. Worked blades and worked micro-blades converted into various types of tools are in large number. The smaller collection among the shaped tools are the borers, choppers and knives.

*Scrapers* : (250 34.40%)

The most conspicuous type is side-scraper of many varieties while other groups are limitedly represented. Thumb nail scrapers are present for the first time in this collection. Combined scrapers are minimum in number. The end-scrapers are fashioned both on the blades as well as on flakes. However, there are scrapers prepared on nodules, among which the core scrapers prepared on nodules are more common. Fine unifacial and shallow retouches have been used. In case of concave, notch, end, and thumb nail scrapers the retouches are generally steep.

*Side scrapers*

They are divided into four sub-types : concave (59 : 23.05), convex (53 : 20.70%), straight (17 : 6.64%), and notched (16 : 6.25%). In them concave and convex scrapers are the most common types. They are prepared generally by working from ventral to dorsal side but the retouches are confined more on the ventral surface. The sizes vary from 50×23×15 to 21×12×4 mm.

*HDT-198* : (Fig. 44.1)

An end-flake of yellowish chert has been retouched on the dorsal margin to convert it into concave scraper. The dorsal margin shows a big flake scar in the

centre and several smaller flakes all around. The under surface is a primary flake surface. A small cortex is seen at the platform. Fresh (31×21×9 mm).

*BRS-68* (Fig. 44.2)

It is a concave scraper fashioned on reddish chert blade. The dorsal surface of it has a mid ridge and fine retouch on the left dorsal margin. On the dorsal surface a few irregular scars are seen over the margins. The blade is broken at the proximal end due to which bulb and platform are removed. Fresh (27×13×5 mm).

*MSD 5* : (Fig. 44.3)

A chalcedony end-flake roughly triangular in shape has been regularly retouched on the right ventral margin for the purpose of preparing a convex scraper. The dorsal surface carries a few longer scars while ventral surface is plain having a few scars along the left margin. Prominent bulb and prepared platform. Fresh (23×13×5 mm).

*MSD 1* : (Fig. 44.4)

A jasper nodule has been worked on the upper surface to prepare a convex scraper. A few smaller flakes have also been removed on the opposite margin leaving a patch of cortex in the middle. Slightly patinated (34×20×10 mm).

*BGR 25* : (Fig. 44.5)

It is a straight side-scraper on an end-flake of reddish chert. The dorsal surface retains two ridges and small cortex along the right margin while on the left side it is nicely retouched to get suitable edge. Fresh (27×13×6 mm).

*BGR 252* : (44.6)

A chert nodule is retouched along one of its margins to convert it into a straight side-scraper. The upper surface retains cortex while a shallow flake has been removed from the under surface. Fresh (23×13×11 mm).

*JPL 44* : (Fig. 44.7)

It is a thin small flake of reddish chert. The dorsal surface retains cortex while ventral surface is plain. The tool has a notch on the left dorsal margin and a few irregular scars over the other margin and at the end. Fresh (17×15×4 mm).

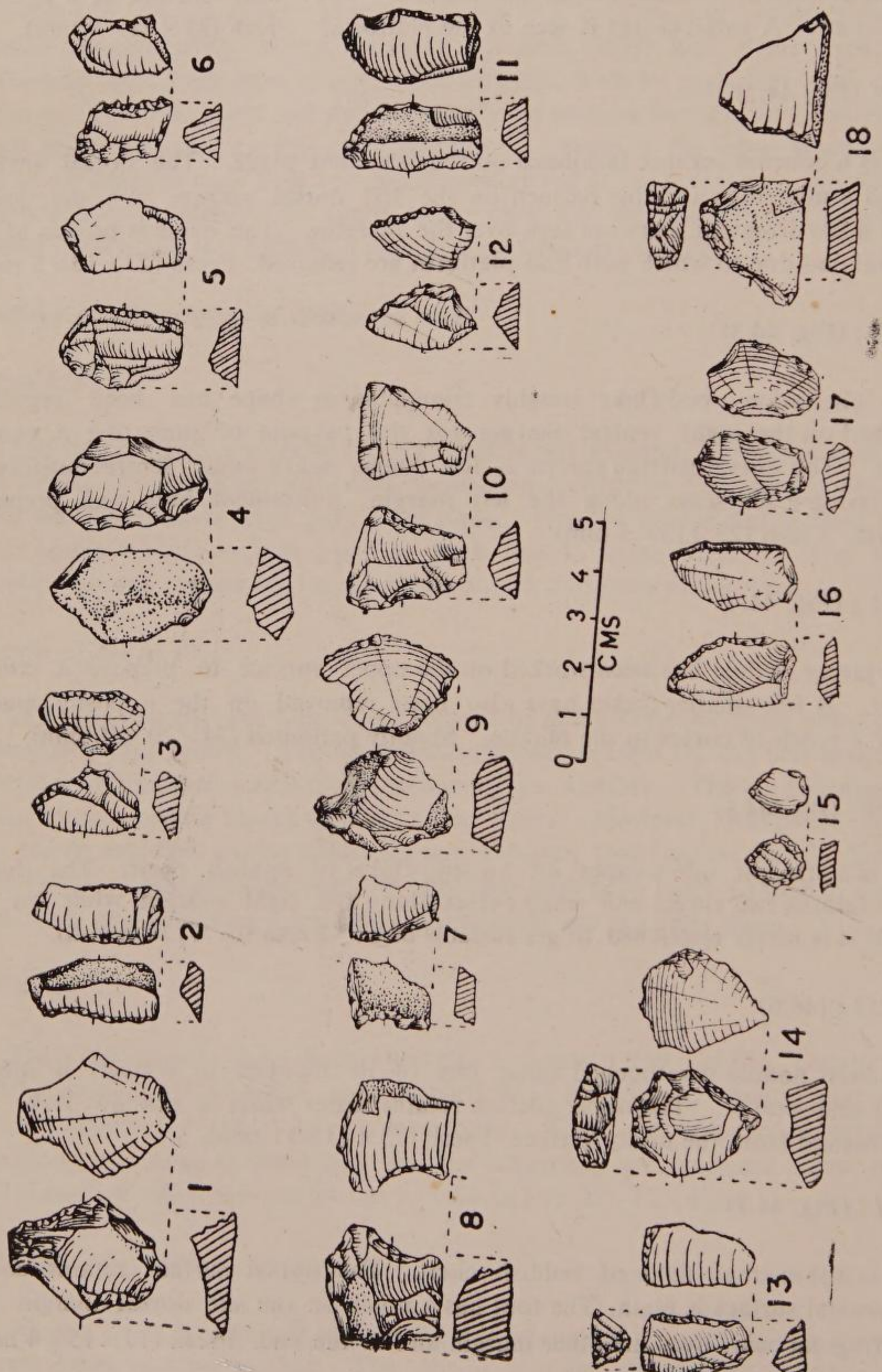



Fig. 44. Mesolithic Tools

*NDA 6* : (Fig. 44.8)

A thick flake of reddish chert has been worked to a notch-scraper. The dorsal surface has several centrally directed scars of various sizes with a small cortex. The cortex is also seen on the left side of the tool. Slightly weathered (24×26×14 mm).

*Double scrapers*

The working is confined along both the margins in these type of scrapers. On the basis of working they have been divided into several groups : Concave-convex (5), Biconcave (1), Straight concave (1) and Biconvex (3). They occur only at a few sites namely Sukda, Paragura, Borai, Mahasamund, Paterapali and Hataud. All are fashioned on the flakes on the dorsal as well as ventral margins. All the scrapers in this group are on chert.

*BRS 27* : (Fig. 44.9)

A side flake of greenish chert has been worked on the concavo-convex margin to have the edges of the scraper. The dorsal surface carries a flake scar and small patches of cortex at a few places, while ventral surface is plain. A small cortex is also seen at the platform. Slightly patinated (22×29×8 mm).

*PTL. 11* : (Fig. 44.10)

It is a biconcave scraper on an end flake of yellowish chert. The dorsal surface retains a mid-ridge and a few small scars. The ventral surface is a primary flake surface and shows a bulbar scar. The flake is little broken at the distal end. Fresh (27×22×8 mm).

*PRR 37* : (Fig. 44.11)

An end-flake of chocolate coloured chert has been retouched along both the margins into a concave-straight double scraper. On the dorsal surface half of the portion retains cortex while the other carries shallow longer scars. The ventral surface carries a few irregular scars on the right ventral margin near the distal end, Fresh (29×16×7 mm).

*KGR 37* : (Fig. 44.12)

It is a biconvex scraper on an end-flake of greenish chert. The dorsal surface retains a few scars while the ventral surface is plain. Bulb and platform are

absent. The working edges of the tool have been achieved on both the surfaces. Fresh (23 × 14 × 6 mm).

*End-scrapers* :

The scrapers of this group have been found at many sites. They are made on flakes and blades at one of the ends. The retouches are generally confined to the convex portions. The end scrapers worked at both the ends are absent in the collection. They range in size between 36 × 19 × 7 and 20 × 10 × 7 mm.

*MSD 32* : (Fig. 44.13)

A blade of yellowish chert has been steeply worked on the convex portion of the end to produce an end-scraper. The dorsal surface retains a ridge and a few irregular scars over the left margin and battering marks over the right one. Fresh (22 ×12 × 8 mm).

*PRR 35* : (Fig. 44.14)

A roughly triangular end-flake of yellowish chert steeply retouched on the convex portion of distal end to convert it as an end-scraper. The dorsal surface carries several irregular scars or various sizes and battering marks along the right margin. The ventral surface is plain. (Fresh 26 × 22 × 7 mm).

*Combined scrapers*

Such scrapers are few (6). Of them one each was collected from Jhipatola, Parsada, Hataud and Chandarpur while at Nandenia two specimens of this group were found. The working in all the cases is steep on the side as well as at the end. All of them are on the flakes. The sizes of these tools range from 30 × 23 × 9 to 22 × 15 × 6 mm).

*PRR 40* : (Fig. 44.16)

An end flake of yellowish chert has been fashioned on the right margin and at the end to achieve the working edges of the combined scraper. The dorsal surface of it retains a few shallow longer scars while the ventral surface is plain. Fresh (22 × 15 × 5 mm).

*KNR 15* (Fig. 44.17)

It is a combined scraper made on a side-flake of a light brown chert. The working is steep and from bottom upwards and is confined on the end and side of

the flake. The dorsal surface retains a ridge at the centre whereas on the ventral surface a small chip is removed on the left margin. The platform is prepared. Fresh (15 × 23 × 6 mm).

*PTR 119* : (Fig. 44.18)

A side flake of chocolate coloured chert has been worked steeply on both the margins and also at the end to prepare a combined scraper. The dorsal surface and the distal end of the tool possess the cortex. Fresh (28 × 23 × 8 mm).

*Thumb-nail scrapers*

These are represented by only seven tools but form an important type in the Mesolithic industries. They are generally retouched rather steeply and minutely.

*NDA 39* : (Fig. 44.15)

It is a thumb nail scraper prepared on reddish chert. The tool is retouched steeply over the three sides leaving the remaining portion untouched. The dorsal surface carries several tiny scars. Fresh (12 × 11 × 5 mm).

*Core scrapers*

The cores of various types have been utilized as tools by retouching along the edges at the base. Sometimes flakes and blades have been struck off in such a way that suitable edges have been formed Such pieces could have served as core scrapers. Most of the sites have yielded such type of scrapers. The maximum number (13) of core scrapers come from Kaunkera site.

*PRR 8* : (Fig. 47.6)

It is a core-scraper on chalcedony pebble. Half of the pebble carries blade scars while other half is covered with cortex. At the base it is steeply retouched. Fresh (26 × 25 × 17 mm).

*SKR 280* : (Fig. 47.7)

A core-scraper on a fluted core of reddish chert. Several parallel sided blades have been knocked off leaving a patch of cortex. A few flakes have been taken out at the base scars of which form an edge. Fresh (20 × 18 × 18 mm).

*Borers* : (10 : 1.46%)

The borers are not common in this collection and are found only at a few sites. These are generally made on flakes and only example is on a nodule. On both the sides of the tip they are worked. In one example it is retouched along the side and thus it could have served as scraper-cum-borer. Among these eight are on chert while one each are on chalcedony and quartz.

*PTL 12* : (Fig. 45.12)

An end-flake of yellowish chert has been finely retouched on both the sides below the tip at the distal end. The dorsal surface carries a big flake scar in the centre and some irregular scars all around leaving a small cortex on the left dorsal margin. The ventral surface is plain. Fresh (26 × 20 × 7 mm).

*Points* : (85:11.30%)

These are the common type of tools in Mesolithic industries and except Tanhkapar, Araud, Ponr and Macheva they are found at all the sites. These tools are made both on flakes and blades. On the basis of working this group has been divided in the following categories :

(a) Simple Points
(b) Points retouched along one margin
(c) Points retouched on both margins
(d) Curved Points

The curved points occur for the first time in this collection. Like earlier cul-.ures the points are worked only unifacially. Sizes vary from 36 × 22 × 10 to 17 × 12 × 5 mm).

*SKR 78* : (Fig. 45.1)

I *KNR* :

It is a simple point on a triangular quartz flake. On the dorsal surface it has a mid ridge and retains deep and shallow scars while on the opposite side is a primary flake surface with a bulbar scar. Fresh. (33 × 20 × 7 mm).

I *KNR* : *206* : (Fig. 45.2)

It is a flake tappering to a point. On the dorsal surface it has a mid ridge and a few shallow scars while the other surface is plain. Near the tip of the point are seen utilization marks. Fresh (23×14×6 mm).

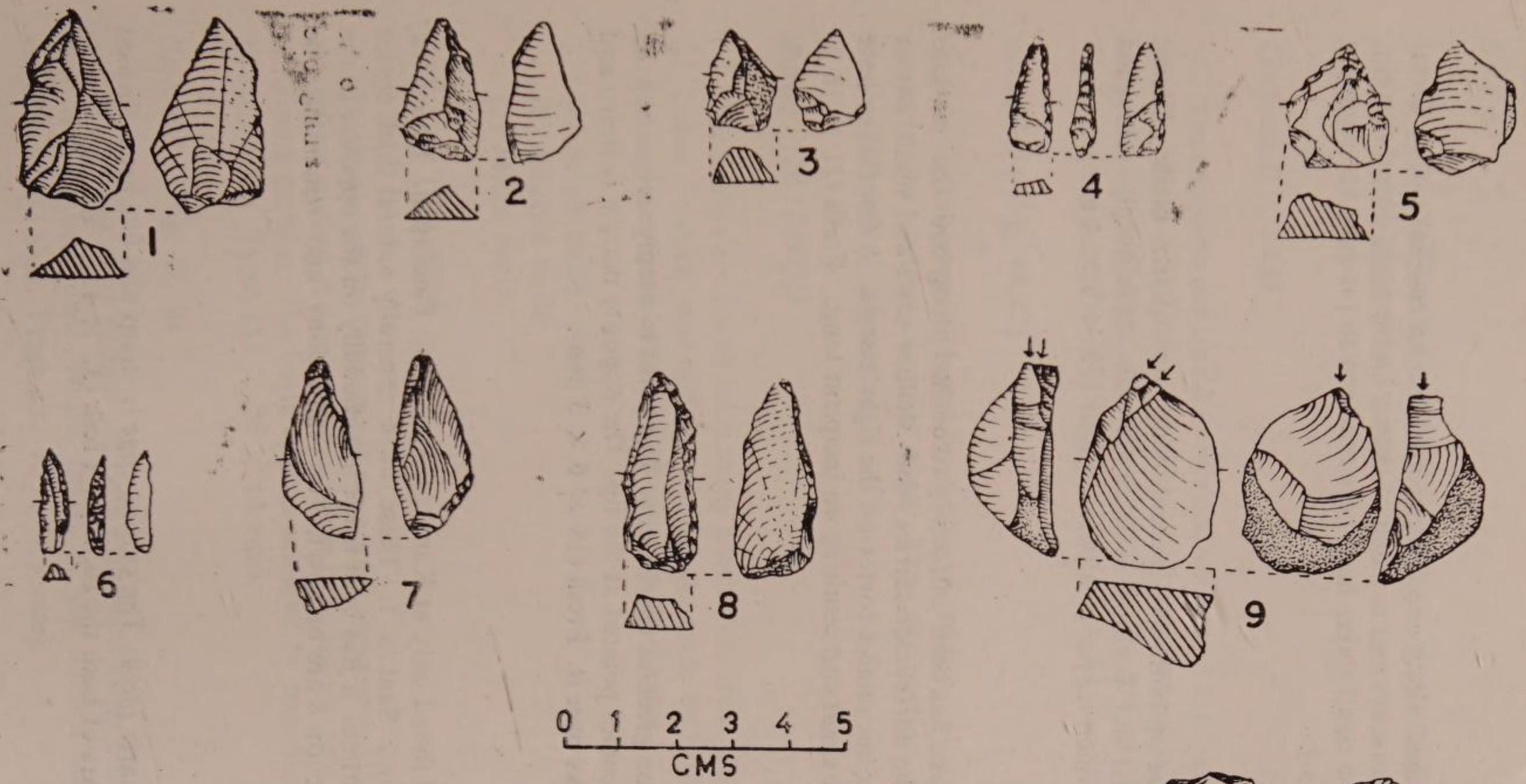



Fig. 45. Mesolithic Tools

II *BGR 267* : (Fig. 45.3)

It is a point retouched along one margin, made on an end-flake, The dorsal surface shows some shallow scars and a patch of cortex on the right dorsal margin. On the proximal end a few small flakes have been removed to produce an incipient tang. Fresh (17×2×5 mm).

*HTD 276* : (Fig. 45.4)

It is a point retouched on both margins and made on a quartz blade. Except a few scars at the proximal end, both the surfaces are plain. It is steeply retouched along both the margins which tapper to a point. Fresh (19 × 8 × 4 mm).

III *BGR 266* : (Fig. 45.5)

A thick triangular flake has been unifacially retouched along both the margins converging to a point. The dorsal side carries some shallow scars and small cortex while ventral side is plain but retains cortex on the right margin. A few flakes have been removed at the proximal end resulting an incipient tang. Fresh (21 × 18 × 8 mm).

IV *PTL 63* : (Fig. 45.6)

It is a curved point on greenish chert blade. The point is steeply retouched on its thick margin and becomes pointed at the tip. The opposite margin is sharp and possesses utilization marks over it. Fresh (18 × 6 × 3 mm).

*Knives* (12 : 1.59%)

Knives are rare and found only at Kanker, Amlipara, Paterapali, Kaunkera, Parsada, Chandarpur and Sankra I. These have generally natural thick cortex covered back but sometimes it has been made intentionally on the opposite to the sharp edge. In this collection 8 are on chert, 3 on chalcedony and remaining one is on quartz.

*PTL 20* : (Fig. 45.7)

It is a knife on a quartz piece. The cutting edge is sharp and has been formed due to intersection of scars of both the su.faces. Fresh (32 × 13 × 8 mm).

*SKR 42*

A knife is made on greenish chert. The tool carries a mid ridge on the dorsal surface while opposite side is plain. It has sharp edge and thick. Fresh (30 × 12 × 5 mm).

*Choppers* (17 : 2.26)

The choppers are found in this collection and are generally fashioned on the small pebbles. All of them are bifacially flaked and include both sides (4) and end choppers (10). Out of fourteen pieces (7) each are on chert and Quartz material. Their size ranges from (40 × 35 × 25 to 20 × 25 × 13 mm).

*SKRI 155* : (Fig. 46.13)

A side chopper fashioned on pebble of reddish colour has been bifacially flaked to have the convex chopper edge. The rest portion of the pebble is the cortex. Fresh (35 × 36 × 23 mm).

*Burins* : (20 : 2.66%)

The burins are found from many sites in the area. They are mainly fashioned on flakes, blades, and nodules while those made on blades are rare. On the basis of working they have been divided in three sub-groups :

(a) Angle burin
(b) Oblique burin
(c) Micro burin

*JDP 110* : (Fig. 45.9)

It is an angle burin made on a thick indeterminate flake of chalcedony. On the dorsal surface it carries cortex at the base and a few shallow scars over the remaining portion. The burin edge is achieved by removing vertical spalls opposed to each other. Fresh (33 × 26 × 14 mm).

*SKR 300* : (Fig. 45.10)

A greenish chert nodule has been fashioned as an oblique burin by taking out two vertical and one oblique spalls. A few shallow scars are seen over both the surfaces at the base. Fresh (27 × 16 × 9 mm).

*KGR 55* : (Fig. 45.11)

It is a reddish chert blade made into a micro-burin. The left oblique portion has retouches while opposite to it an oblique spall has been taken out. The dorsal surface carries some shallow scars and a patch of cortex at the base. Fresh (13 × 10 × 2 mm).

*Lunates* : (98 : 13.00%)

The lunates are one of the characteristic tools of this culture and are represented with significant percentage. Except a few most of the sites have yielded tools of this variety and have been divided in three sub-groups :

(a) symmetrical
(b) asymmetrical and
(c) broken.

It is seen that the lunates generally have blunted back opposite to the working edge which has been achieved generally by bifacial working. However, some pieces have been blunted only from one side. A few lunates carry use marks along their working edges. The sizes vary from 30 × 13 × 6 to 10 × 7 × 3 mm).

*KNR 49* : (Fig. 46.22)

A greenish chert blade has been worked as a symmetrical lunate. The back blunting over the convex margin is bold and bifacial while opposite short margin is slightly concave and carries some battering marks. Fresh (27 × 7 × 3 mm).

*CDR 20* : (Fig. 46.23)

A whitish chert blade is converted in to an asymmetrical lunate. It has small cortex and a ridge over the dorsal surface. The working edge is slightly curved while the opposite margin is bifacially worked into cresentic back. Fresh (22 × 10 × 4 mm).

*SKR 30* : (Fig. 46.24)

It is an asymmetrical lunate on a thin micro-blade of white chert. The tool is blunted over the convex margin by fine working while the opposite straight edge bears utilization marks. Fresh (24 × 7 × 3 mm).

Fig. 46. Mesolithic Tools

*HTD 97* : (Fig. 46.25)

A symmetrically curved lunate is prepared on a micro-blade of chalcedony. The convex back is unifacially blunted. Fresh (20 × 6 × 3 mm).

*Triangles* : (12 : 1.59%)

In this group the isocelene triangles are the common type while the other types are rare. Although small in number they have been found at many sites. The triangles are mainly fashioned on blades and are on chert (7) chalcedony (2) and quartz (3) and the size range between 22 × 9 × 4 and 9 × 6 × 3 mm.

*HTD 676* : (Fig. 46.26)

It is a triangle made on a micro-blade of greenish chert. The cutting edge is sharp and other two margins are blunted. Fresh (16 × 5 × 4 mm).

*KNR 635* : (Fig. 46.27)

A triangle on quartz blade with one blunted side. Fresh (19 × 7 × 2 mm).

*BRS 34* : (Fig. 46.28)

It is a triangle on a reddish chert. The working edge is straight and the other two margins are blunted. Fresh (17 × 8 × 2 mm).

*Worked Blades* (14 : 1.86%)

This type is common and two sub-types can be made out : one margin retouched and both margin retouched blades. One margin retouched blades are more common while those retouched on both margins are few. The retouched are generally fine and are confined on one or both margins.

*KGR 16* : (Fig. 46.4)

A quartz blade is retouched along one of the margins. The dorsal surface. covers a mid ridge while a bulbar scar is on the ventral surface. Fresh (47×18× 10 mm).

*PRR 39* : (Fig. 46.5)

A parallel sided blade of reddish chert retains several longer and some irregular scars on the right margin. On the left dorsal margin it is finely retouched to

form a working edge of the blade. The blade is broken at the proximal end. Fresh (30 × 15 × 6 mm).

*SKR 188* : (Fig. 46.6)

It is a blade of reddish chert retouched on both the margins. The dorsal surface of the tool retains a mid ridge while on the other side there are two small shallow scars on the right ventral margin. The tool is broken at the distal end. Fresh (24 × 13 × 3 mm).

*JDP 53* : (Fig. 46.3)

A both margin retouched blade is on a grey chert. The dorsal surface carries a mid ridge and a few narrow scars at the proximal end. Fresh (36×13× 6 mm).

*Worked micro-blades* : (225 : 29.88%)

The micro-blades having secondary work are included in this group and on the basis of working they have been divided into following sub-groups :

(a) One margin retouched blades
(b) Both margin retouched blades
(c) Backed blades
(d) Backed-cum-obliquely truncated blades and
(e) Backed-cum-one margin retouched blades.

These have generally been worked on the margins and sometimes on the oblique side at one of the ends. The retouches are on both the surfaces and in case of backed blades the blunding is on one of the thicker margins.

*SKR 191* : (Fig. 46.14)

It is one margin retouched blade on brown chert. On the dorsal surface it has a mid ridge whereas on the ventral surface the blade carries retouches along the ventral right margin. Fresh (24 × 9 × 4 mm).

*JDP 56* : (46.13)

A chalcedony micro-blade is retouched along one of the margins. The dorsal surface carries a few narrow scars over half of the portion while another half has

a ridge. The blade is broken at both the ends loosing bulb and platform. Fresh (26 × 10 × 4 mm).

*HTD 627* : (Fig. 46.15)

It is a blunted blade on yellowish chert. The working edge is sharp and another margin is blunted from both the sides. Fresh (21 × 6 × 3 mm).

*JDP 89* : (Fig. 46.16)

A back-blunted blade is made on white chert. The tool is slightly curved. Fresh (27 × 7 × 5 mm).

*SKR 302* : (Fig. 46.17)

A micro-blade of black chert has been blunted bifacially to prepare a backed blade. The working edge is slightly concave and has utilization marks over it. Fresh (27 × 7 × 5 mm).

*JDP 58* : (Fig. 46.18)

It is a backed blade of chalcedony. On the dorsal surface it retains small cortex and several shallow scars over the remaining portion. It is blunted only on the half portion. Fresh (24×7×5 mm)

*HTD 204* : (Fig. 46.19)

It is a blade on white chert. The dorsal surface carries several parallel scars and a tiny bulb on the ventral surface. The blade is blunted on its thick margin. Fresh (29×6×3 mm)

*HTD 151* : (Fig. 46.20)

A chalcedony blade is blunted and obliquely truncated into a backed blade. The dorsal surface retains a few scars while the ventral surface is plain. Fresh (132×7×3 mm)

*JDP 72* : (Fig. 46.21)

A chalcedony backed blade with retouch on one margin. The back is blunted and the opposite margin is finely retouched. Fresh (25×7×3 mm)

**Simple artifacts**

Almost all the sites of this culture are the factory sites. As such alongwith the shaped tools they have also yielded waste products in large quantity which are rarely subjected to any intentional working. The simple artifacts are found at all sites, the total collection of which amounts to and has been divided into several groups as under :

| | |
|---|---|
| Cores | Flakes |
| Core rejuvenation flakes | Simple blades |
| Simple micro-blades | Chips |
| Worked nodules | Hammer stones |

*Cores* : (573 : 15.75%)

Various types of flakes and blades have been struck off from the cores with the result that the cores bear different kinds of scars, shallow or deep, regular or irregular in nature. Some of them have been employed all over while some are partly flaked and carry cortex on the remaining portions. These have been divided into four sub-groups on the basis of flake scars.

(1) Flake cores (196)
(2) Micro-blade cores (365)
(3) Blade cores and (7)
(4) Discoidal cores (5)

In the collection the micro-blade cores and flake cores constitute the larger group while the blade and discoidal cores are numerically few. In the micro-blade cores the blades are struck off in one or both directions.

*KNR 6* : (Fig. 47.5)

A quartz pebble is selected for flakes. The flake scars of various sizes, shallow and deep in nature, cover both the surfaces leaving a small cortex at the upper end. Fresh (22×26×15 mm)

*SKR 44* : (Fig. 47.3)

A brown chert nodule has been taken for striking off micro-blades. Several parallel sided narrow blades have been detached from one direction over the upper surface while on the other a broad scar is seen. The platform is properly prepared to facilitate flaking. Fresh (20×17×14 mm)

*HTD 485* : (Fig. 47.4)

It is a micro-blade core struck from one direction on yellowish conical chert. The core is flat at the base and several micro blades have been struck off regularly from bottom upwards over three-fourth of the surface leaving rest portion unworked cortex. Fresh (25×19×17 mm)

*CDR 200* : (Fig. 47.2)

It is a micro-blade struck from two directions on a whitish chert nodule. On the longer side it carries several parallel scars while on the narrower side only a few small blades have been detached.

*BTR 1* : (Fig. 47.1)

It is a conical blade core on a brown chert piece. The core has been flaked all around to obtain blades of various sizes. The under surface is properly dressed before striking off the blades. Fresh (43×40×34 mm)

*SKR 281* : (Fig. 47.8)

A discoidal core on milky quartz having the centrally directed flake scars of different nature (36×24×16 mm)

*Flakes* : (1125 : 30.92%)

The flakes are extremely common at the factory sites alongwith the finished tools. In the present collection their number is quite high (1125). They have been divided into following groups :.

| | |
|---|---|
| (1) End flakes | (706) |
| (2) Side flakes | (202) |
| (3) Utilized flakes | (148) |
| (4) Indeterminate flakes | (32) |
| (5) Core rejuvenation flakes | (37) |

These flakes show different types of scars on the dorsal side while ventral side they have prominent or defused bulbs of percussion. The platforms are generally plain and only a few show preparation before striking off the flakes.

*BTR 4* : (Fig. 47.10)

It is an end flake of brown chert. The flake carries several irregular centrally directed shallow and deep scars on the dorsal surface. The lower surface is plain. Fresh (39×33×8 mm)

*SKR 278* : (Fig. 47.9)

An end-flake of yellowish chert showing several longer scars and a few broad centrally directed flake scars with a small cortex patch at two places over the dorsal surface. The ventral surface is plain and carries negative bulb, and cortex on the platform. Fresh (38×29×9 mm)

*HTD 195* : (Fig. 47.11)

It is a triangular end-flake of yellowish chert. The fiake shows a mid ridge and some longer scars on the dorsal surface. On the ventral surface a small triangular scar is seen on the right margin. The flake is broken at the proximal end due to which bulb as well as platform are missing. Fresh (38×23×10 mm)

*HTD 160* : (Fig. 47.13)

A thin flake of greenish chert possesses several scars of various sizes taken mostly from distal end towards proximal end. On opposite surface it bears utilization marks along the margins and a deep scar on the left margin. Fresh (34×24×4 mm)

*KNR 21* : (Fig. 47.14)

A sub-rounded side-flake on reddish chert. The dorsal surface bears shallow scars of different types and a small cortex near the proximal end. The ventral surface is plain with a little cortex at the platform. The flake carries utilization marks on the margins. Fresh (24×27×9 mm)

*SKR 68* : (Fig. 46.15)

It is a side-flake on blakish chert. The dorsal surface has many irregular scars and a patch of cortex. The ventral surface shows damage marks at a few places and cortex over the platform. Fresh (27×25×8 mm)

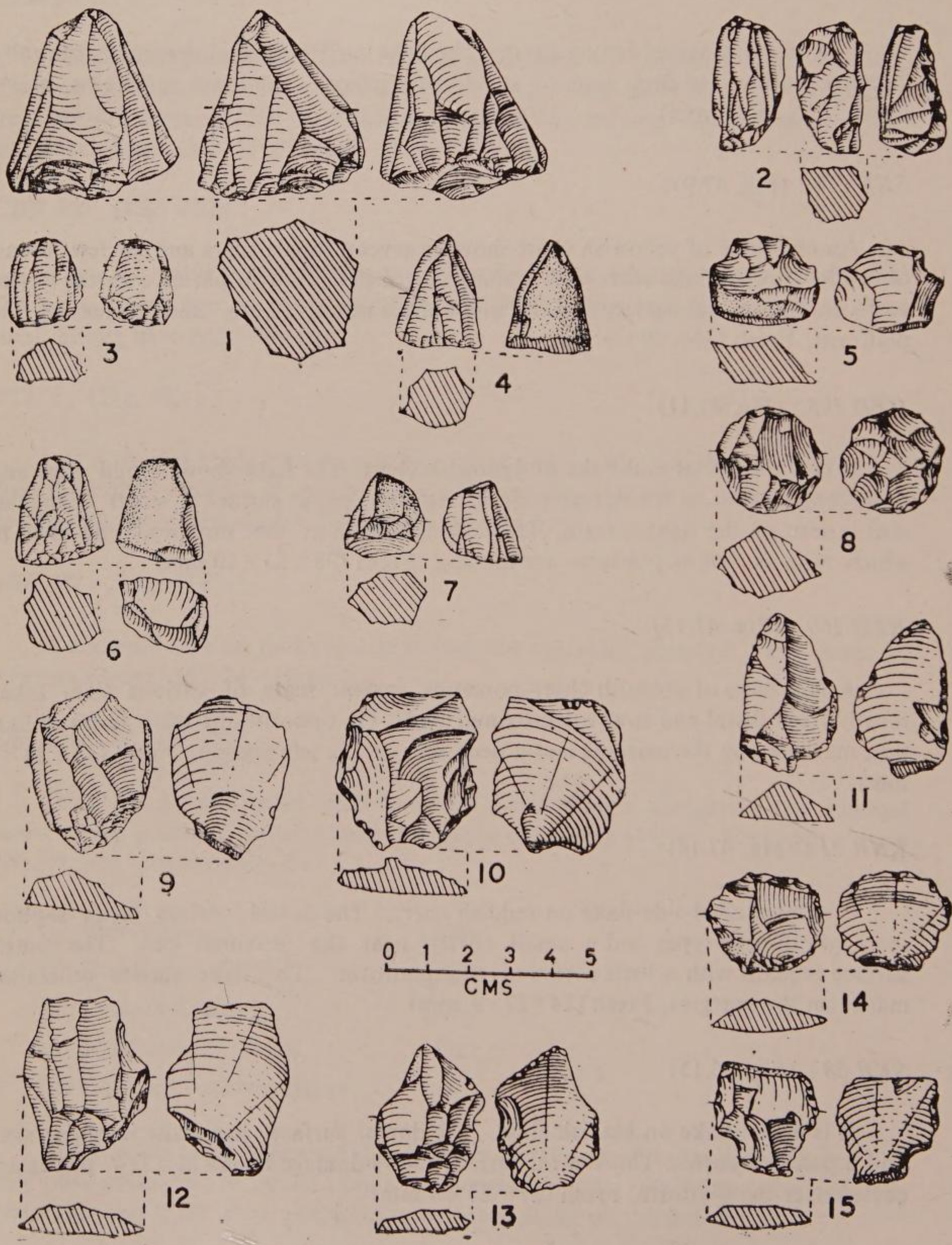



Fig. 47. Mesolithic Tools

*CDR 18* : (Fig. 47.12)

It is a core rejuvenation flake on greenish chert. The dorsal surface carries several parallel scars while the ventral surface is plain. Fresh (40×27×7 mm)

*Unworked Blades* : (202 : 5.55%)

These blades do not carry intentional working along their margins. As such they are simple blades. However a few blades show battering along their margins which may have caused due to utilization. Some of them are also broken therefore they have been grouped separately. They are sub-divided as under :

| | |
|---|---|
| (1) Complete blades | (75) |
| (2) Broken blades | (115) |
| (3) Utilized blades | (12) |

At a few sites the blades are not found while the micro-blades are present at all the sites. The size of these blades are from 47×17×10 to 24×12×4 mm)

*CDR 60* : (Fig. 46.1)

A thick jasper blade retains some scars on the dorsal surface and a cortex along the right margin. On the ventral surface some chipping has been done at the proximal end due to which the bulb is erased. Fresh (47×17×10 mm)

*BGR 20* : (Fig. 46.7)

It is a blade on chalcedony. It carries several longer scars over dorsal surface while the ventral side is plain and bears a prominent bulb and small platform. Slightly patinated (31×12×6 mm)

*SKR 148* : (Fig. 46.2)

A blade of yellowish chert possesses longer scars of various types all over the dorsal surface while ventral surface is plain. It bears utilization marks along one margin. Slightly rolled. (44×14×7 mm)

*Unworked micro-blades* : (663 : 18.22%)

Such type of micro blades are quite abundant. They are generally parallel sided blades having no retouch on the margins. Some of them however carry utilization marks. They consist of :

| | |
|---|---|
| (a) Complete micro-blades | (242) |
| (b) Broken micro-blades | (348) |
| (c) Utilization micro-blades | (83) |

A few crested guided ridge blades have also been found but their number is very small hence they have not been classified separately. Their size range between 40×11×6 and 10×3×2 mm. Such crested ridge blades are sometimes considered as of Chalcolithic culture but there is no other evidence to establish chalcolithic culture.

*KNR 42* : (Fig. 46.8)

A simple micro-blade is struck from a greenish chert core. It carries several scars over the dorsal surface and cortex along both the margins. The blade is broad at the proximal end and narrow at the distal. Fresh (36×9×7 mm)

*SKR 154* : (Fig. 46.9)

It is a simple micro-blade on dolerite. The dorsal surface bears several irregular scars and small cortex along the right margin and at the distal end. The ventral surface carries a tiny scar on the right margin. Fresh (29×8×6 mm)

*BTR 58* : (Fig. 46.10)

A simple micro-blade retains a few longer scars on the dorsal surface while other side is plain. It shows a few utilization marks on the right margin. Fresh (26×8×4 mm)

*JDP 55* : (Fig. 46.11)

It is a micro-blade having crested guided ridge. The dorsal surface possesses scars only one side of the ridge. Fresh (38×8×7 mm)

*HTD 82* : (Fig. 46.12)

A micro-blade of yellowish crested guided ridge. On the dorsal surface, a ridge and the scars over both the sides are seen while the ventral surface is plain. Fresh (33×11×5 mm)

As observed in the case of the factory sites this collection also contains a large number of chips (748 : 20.55%) worked nodules (326 : 8.96%) and a few Hammerstones (21 : 0.51%).

**Discussion**

Excepting a few regions, the Mesolithic industries are found throughout India in varied geomorphological situations. The tools in this industry are microlithic in form and used as composite tools. In places they display very fine workmanship. In Mesolithic culture conventionally two types of industries are distinguished : geometric industries and non-geometric industries. Some Mesolithic industries are associated with the potteries with decorated designs. The industries which contain non-geometric forms are chronologically regarded as earlier than those yielding geometric forms along with the potteries. It has also been noticed that the sites which have yielded geometric tools sometimes also have yielded metal objects. (Sankalia 1965 : 65, Joshi and Khare 1968 : 245-264, Misra 1973 : 92-110) and have been termed as 'Late Mesolithic cultures'.

During Mesolithic, the prehistoric man had shown special preference to the fine grained silicious minerals of chert and chalcedony families. These are commonly found in association with sedimentary formations and volcanic rocks like 'Deccan Trap'. Wherever this material was not available the next preference was quartz in crystal and vein forms. This is mostly in the southern peninsula where the chief rock formations are Archaeans and Dharwars. The component rocks of which are not suitable for designing small tools of the Mesolithic culture. These rocks however contain vains of quarts, some of them of very large size which are most suitable for microlithic industries. The exposures have been cited from Nagarjunakonda (Joshi 1975 ; 8-10) and Karnataka region (Foote 1876 : 226-230) where the entire hills are composed of slabs and fragments of quartz veins. They form the factory sites for the manufacture of microlithic industries. In north India at some places although the chert was plentifully available quartz has been utilized for making tools. Such sites are Sarai Nahar Rai (Dutta *et al* 1971 : 500-501), Kurha (Sharma 1973 : 110) Lekhahia rock shelter (Smith 1906 : 187) and open air settlements like Maihar (Misra, 1977 : 1-21) and Birbhanpur (Lal 1958 : 4-48). At a few sites other raw materials like quartzite (Gujarat, Birbhanpur and lower Godavari) silicious wood (Birbhanpur and lower Godavari), indurated shale and slate (Lower Godavari and Kurnool) have also been utilized. In the upper Mahanadi region both the chert and quartz were available in the form of nodules. The tools made on quartz constitute nearly 25% of the total.

In the upper Mahanadi valley, 33 sites of the Mesolithic culture have been discovered on the Mahanadi river and its two tributaries : the Hasdo and the Jonk. The sites of this culture are located over the rocky surfaces, and lateritic and alluvial plains. However, at Tanhkapar, the tools have been found from the river section, about a metre above the present river bed sealed by 4 m. thick alluvium. The tools made on flakes, blades and nodules are smaller in size than those of the

Upper Palaeolithic tools. Technologically this industry shows an advanced stage and the tools manufactured on the quartz in the preceding Upper Palaeolithic industry were only a few. Nowhere microlithic tools were found associated with pottery. The Mesolithic collection includes scrapers, borers, knives, points, lunates, triangles worked blades and micro blades and choppers. Like in earlier cultures the scrapers are the dominant types among the shaped tools. The blade types having various forms have equally been represented very well. They are finely retouched. The knives in the previous culture had natural back opposite to cutting edge but in this culture several pieces have intentionally prepared back. The points are made on flakes as well as on blades. The burins which are found about 10% in the earlier culture are very less (2.66%) in Mesolithic collection. Compared with the Upper Palaeolithic industries in Mesolithic the percentage of simple and worked micro-blades is very high while the simple and worked blades show marked decrease. The various values of the Mesolithic blades and micro-blades are less than those of the Upper Palaeolithic .(Fig. 48 and Table 21). However, the scattered diagrams (L/B and B/T) of the Upper Palaeolithic and Mesolithic blades very clearly show that these tools belong to a homogeneous group as the diagrams show less amount of scattering. (Figs. 49-52). Among the semi-geometric and geometric forms the lunates are prolific while triangles are few (1.59%). Although the lunates are present in the Upper Palaeolithic collection but triangles appear for the first time in this culture in addition to lunates. The choppers are of bifacial variety and smaller in size. The general distributional pattern of Mesolithic industries in India shows that each site occurs on various landforms :

(i) Hill-tops and hill-slope sites
(ii) Riverine sites
(iii) Coastland sites
(iv) Alluvial or lateritic plain sites
(v) Sand dune sites
(vi) Cave or rock shelter sites
(vii) Ox-how lake sites.

The Madhya Pradesh is a nuclear area for this culture also. The region has preserved the evidences of this culture from every part and on various geographical situations like hillslope or foot hills, flood plains and caves and rock shelters. A series of cave like and open rock shelters have been formed in the Vindhyan hills. Several of them have been systematically excavated which have provided evidence of human settlements right from Lower Palaeolithic times. Many of these shelters bear prehistoric paintings on their walls and ceilings.

The microlithic culture in Madhya Pradesh came to be known since the thirties of this century when Hunter (1935 : 31 and 1937 : 127) excavated a rock shelter at

TABLE 21

**Various Values of Upper Palaeolithic and Mesolithic Blades and Micro-blades**

| Mean | *Upper Palaeolithic* | | | | | | *Mesolithic* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Blades* | | | *Micro-blades* | | | *Blades* | | | *Micro-blades* | | |
| | *Length* | *Breadth* | *Thick-ness* | *Length* | *Breadth* | *Thick-ness* | *Length* | *Breadth* | *Thiick-ness* | *Length* | *Breadth* | *Thick-ness* |
| Mean | 34.49 | 15.01 | 7.92 | 22.41 | 9.18 | 4.58 | 30.22 | 13.20 | 6.128 | 20.42 | 8.15 | 3.97 |
| Standard deviation | 8.90 | 2.49 | 2.17 | 4.86 | 1.89 | 1.46 | 5.83 | 1.44 | 2.06 | 4.69 | 4.65 | 1.20 |
| Coefficient of variation | 25.80 | 16.61 | 27.42 | 21.67 | 20.56 | 31.92 | 6.13 | 1.92 | 3.62 | 21.03 | 20.50 | 1.43 |

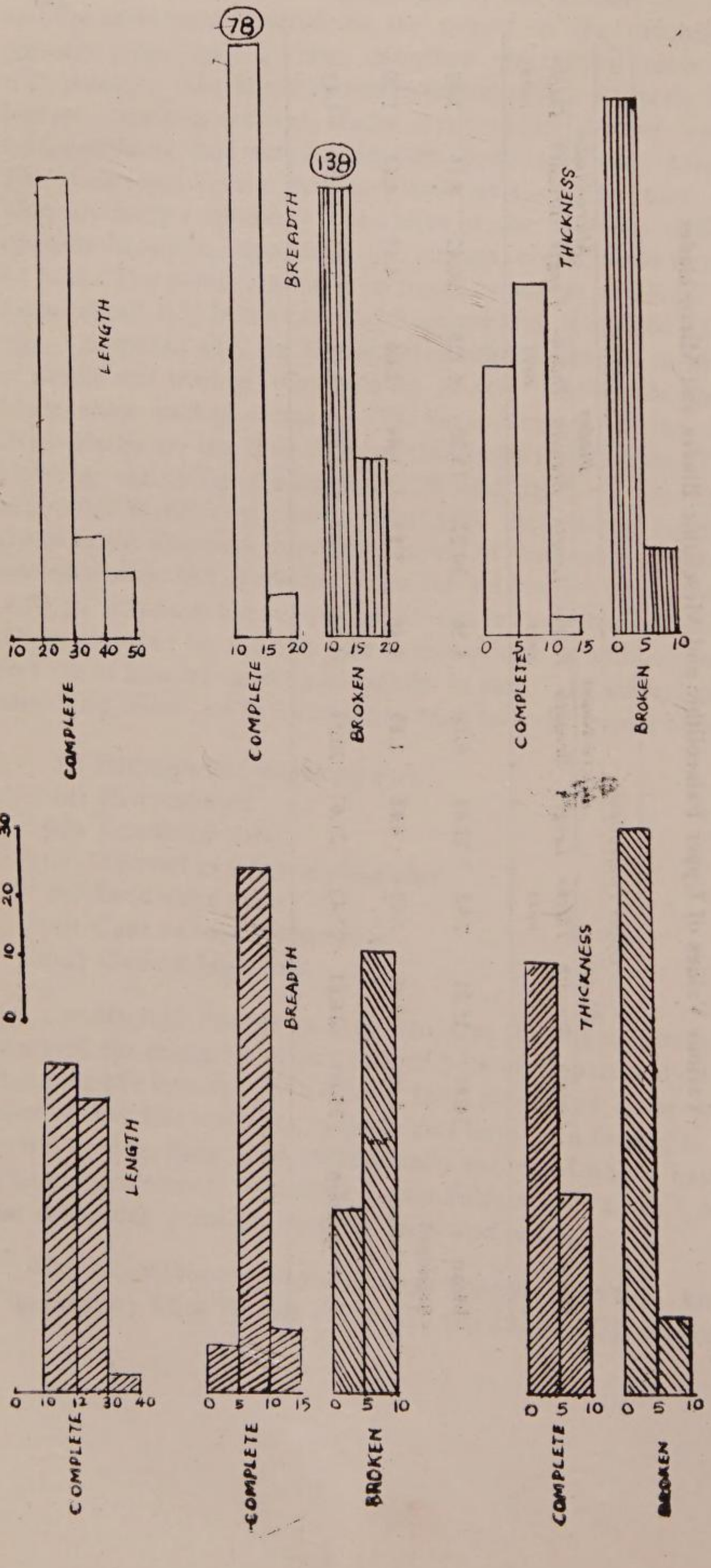



Fig. 48. Mesolithic blades and Micro blades : Frequency distribution of Length, Breadth and thickness

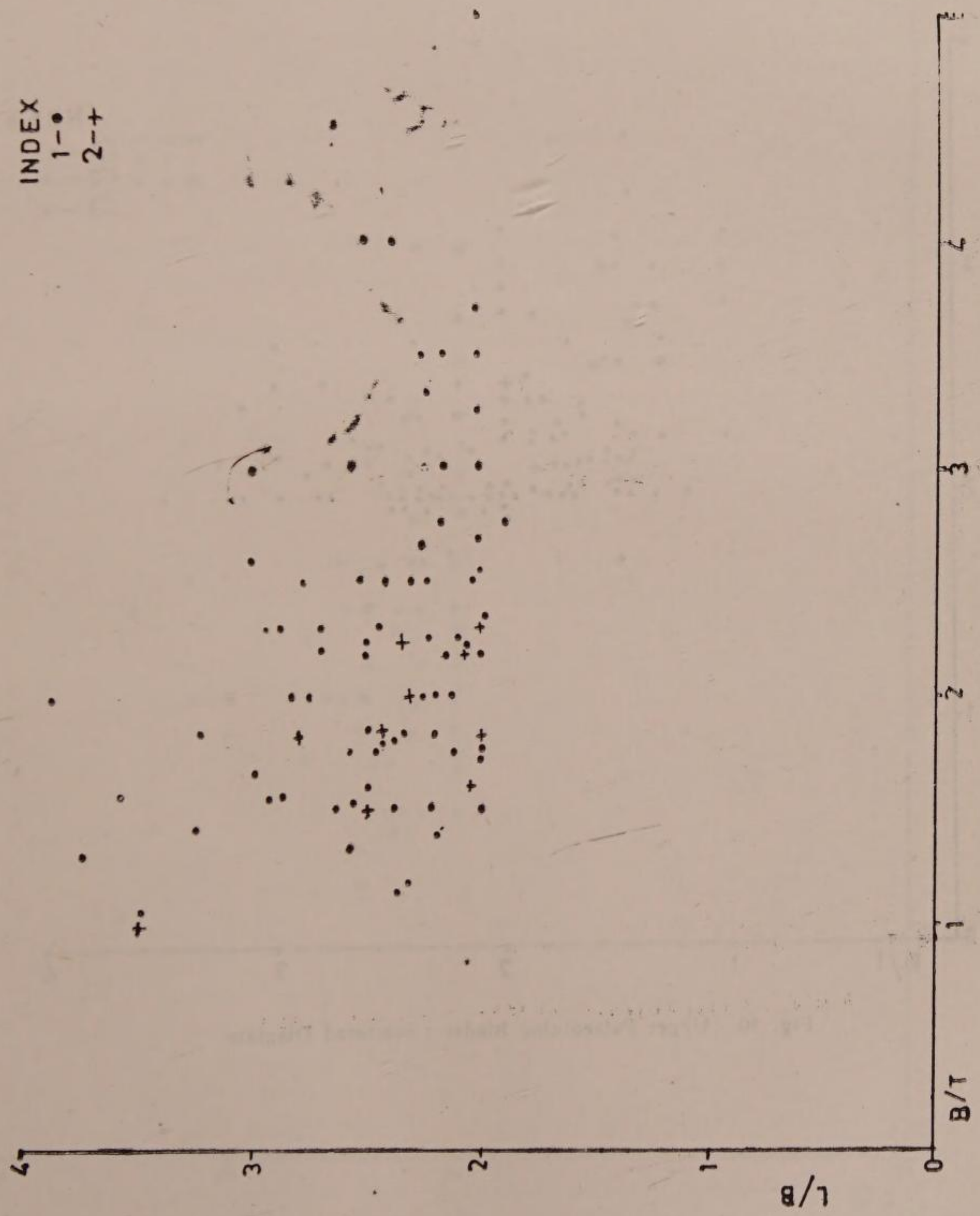



Fig. 49. Upper Palaeolithic Micro Blades : Scattered Diagram

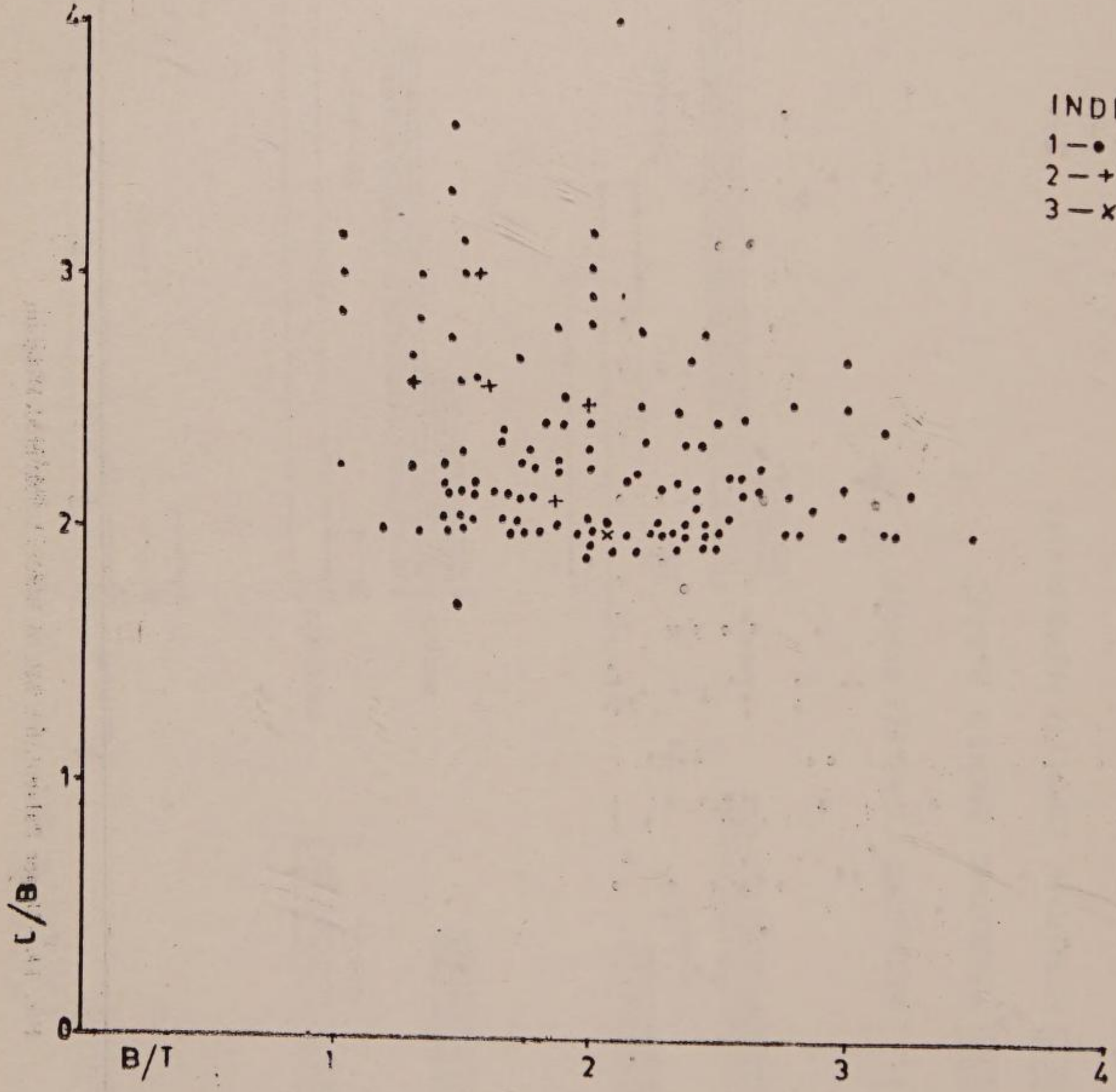



Fig. 50. Upper Palaeolithic Blades : Scattered Diagram

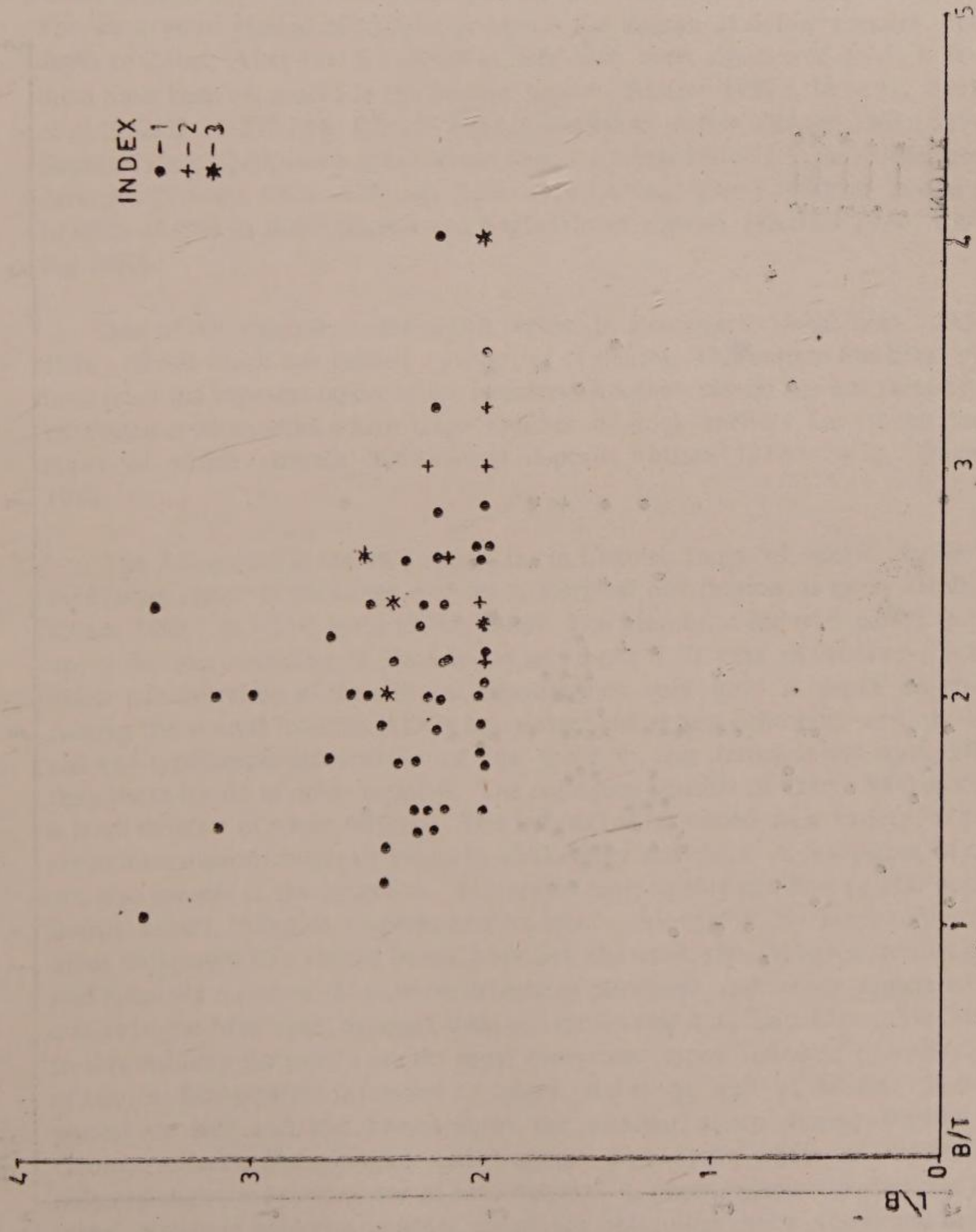



Fig. 51. Mesolithic Blades : Scattered Diagram

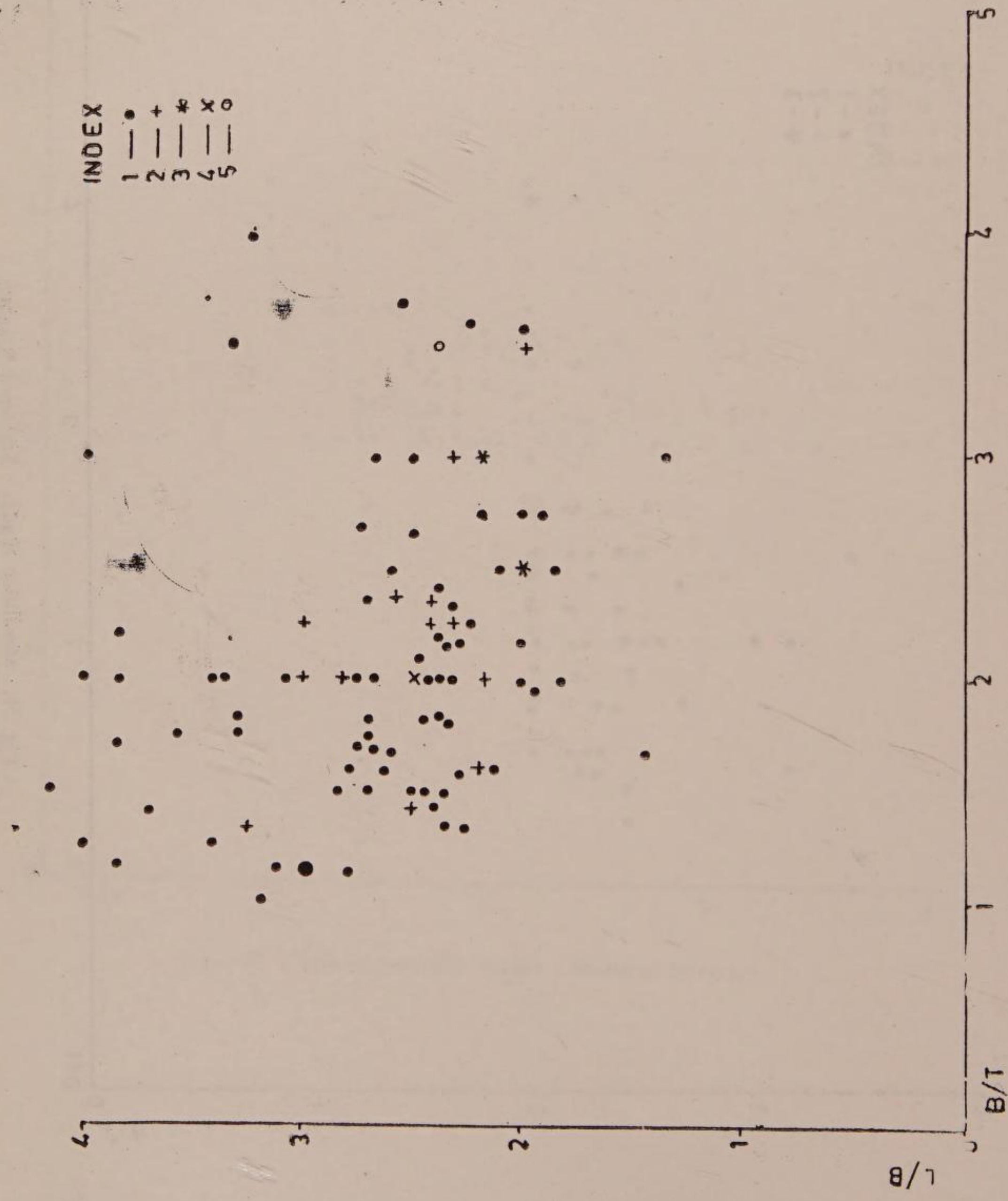



Fig. 52. Mesolithic Micro Blades : Scattered Diagram

Pachmari in the Mahadeo hills. In the mean time Gordon (1938 : 21) discovered Mesolithic industries from the Simla hills in the out skirts of Jabalpur city. Later on Baria Hari cave was excavated again on the Pachmarhi hills (Ghosh 1948 : 14). This excavation yielded microliths alongwith the human skeleton remains upto a depth of 2 feet. After that a number of sites have been discovered and a few of them have been excavated in the Malwa region (Khatri 1958 : 182-191, Sankalia *et al* 1952/53 : 1-257 IAR 1958-59 : 28) in Narmada valley (Khatri 1961 : 519-530, Supekar 1968 : 2-3), some sites around Sagar (Bajpai 1964 : 1-5, many sites around Jabalpur (Sharma 1974 : 139-154), Son valley (Ahmad 1966 : 138-158) and a large number of sites in Bundelkhand and Baghelkhand regions (Sharma 1974 : 139-152; Pal 1980).

One of the important sites in this region is Adamgarh (Joshi 1968 : 245-254, 1978 : 40-46) which has yielded a variety of evidences. This culture has been unearthed from the topmost layers of the trenches. Another classic site has recently been excavated is Bhimbetka where large number of rock shelters have been located many of which contain habitational deposits (Misra 1979 : 14-22, Wakankar 1978)

The Adamgarh is the only site so far in Central India of which the detailed excavation report is published and the typological distribution is given (Joshi and Khare 1968 : 245-254, Joshi 1978 : 40-46). The Mesolithic industry comes from the upper portion consisting of black layers of about 1.50 cms in thickness but the major concentration of the cultural deposits lies only upto a depth of 80 cms. Among the several trenches ADGI has yielded the richest collection and the material and typological distribution of the tools in this trench is not much different than those found in other trenches. The collection consists of nearly 5000 tools with a large number of waste material. The industry is fashioned on a variety of criptocrystalline silicious minerals generally chalcedony and chert. A few pieces of quartz are also present in the collection. The major tools at this site are points, scrapers, burins, borers, triangles, trapezes and tranchet. Alongwith the stone tools various other antiquities like animal bones, potteries, charcoal, glass bangles, iron fragments and hamatite nodules. Due to occurrence of potsherds and other associated antiquities in the Mesolithic deposits Joshi has designated it as 'Late Mesolithic Culture'. In this industry the points are the most prominent types followed by various types of blades. Scrapers are fashioned on cores, flakes as well as blades. Borers (23 pieces) are less and the burins form the smallest group among the tool types. Geometric forms like triangles and trapezes also occur where as the Mahanadi industry shows the similar use of raw material, it possesses minor differences in tool types. Nowhere pottery and other associated antiquities have been found in Mahanadi valley. Besides points, various types of blades and scrapers are dominant in it.

The tranchet and the trapezes are altogether absent in Mahanadi area. A few forms like choppers which occur at all the stages in the upper Mahanadi are not found in the Adamgarh collection. Ceramic associations of the Adamgarh industry suggests its later date than that of the upper Mahanadi Mesolithic industry.

Another systematically excavated site is Bhimbetka in the same area (Misra *et al* 1977 : 14-16). But the detailed report of the excavation has not yet been published. Several rock shelters containing deposits of this culture have been excavated which varies from 0.20 m to 1.50 m in thickness in different shelters. Unlike the earlier lithic industries, this industry has been fashioned mainly on chert and chalcedony. The tool types are blunted back blades, obliquely truncated blades, points, crescents, triangles, trapezes and transverse arrow heads. Besides these, variety of scrapers. borers, burins, flake tools and core tools are also found. Here too phases of the culture have been recognised. In earlier phase, blade tend to be longer, wider and thicker and the proportion of geometric microliths is smaller while in the later phase bladelets (microblades) become smaller and more symmetrical. The cores also display greater masterly of technique. Apart from the lithic implements bone and antler points have also been found from the excavations. The skeleton remain has also been unearthed in an extended or encrouched position having the head usually to the east in the living areas. The Mahanadi industry shows a great similarity with those of Bhimbetka in the nature of site, the use of raw material and also distribution of tool types. Both the industries are aceramic and yield more or less tools of similar technology and typology. A few types like trapezes and transverse arrowheads of Bhimbetka are not present in the Mahanadi collection and a few types like choppers are absent in the Bhimbetka. The absence of bone tools and other evidences in the Mahanadi area may be due to the fact that all the sites of the area are surficial occurrences so that organic material got destroyed. Besides no sites could be excavated due lo lack of suitable deposit.

In Rajasthan Mesolithic industries are mainly located east of Aravali and only a few in the west of the hill ranges. Rich concentrations of this culture are seen in the eastern parts of Rajasthan in the Berach basin, the Banas and the Chambal rivers in Udaipur. The Luni basin in east Aravali area in Pali and Jodhpur districts (IAR 1959-60 ; 40, 1956-57 : 19 and 1958 : 74) have some mesolithic sites.

Of these sites only Nimbahera, Mandapia and Bagor have been regarded as type sites. The first two are the factory sites located on the river banks. Here, the blades and blade tools are in profusion consisting of blades, backed blades, blunted blades as well as lunates and several types of scrapers. The Bagor is associated with sand dunes locally known as Mahasati dune on the Kothari river, a tributary of the Banas. The total thickness of the habitation deposite was about 1.50 m which has

been divided into three phases on the basis of cultural material. (Misra 1973 : 92-110).

*Phase I—5000-2800 B.C.* (50-80 cm) Microlithic industry, animal remains, stone-paved floors in Wattle huts, burial in an intended position with east-west orientation.

*Phase II-2800-B.C.-600 B.C.* (30-50 cm) Microlithic industry and animal bones decline, metal tools and pottery (hand made) appear, burial in east-west direction, posts, metal tools, ornaments and food offerings.

*Phase III 600 B.C.-200 A.D.* (35-75 cm) Microlithic industry greatly declines, animal bones scarce, iron tools and pottery (wheel made) plentiful, glass beads, structure with tiles and bricks burial in north-south orientation.

Another sand dune site Tilwara on the Luni river in Barmer district has yielded habitational deposit upto 90 cms (Misra 1971 : 59-77). Here also varieties of antiquities : quern, sling balls, animal bones potteries and structure have been found. The microlithic industry is technologically not much different from those of the Bagor. The raw material at both the sites is chert and quartz but quartz has been utilized on larger scale. Number of micro blades and blades have been converted into various types of tools while tools fashional on cores and flakes are rare. It should however be mentioned that although here three sub phases have been marked out on the bases of antiquities there is not much typological change in the Mesolithic industry.

Regarding raw material these sites show same affinity with those of the Mahanadi. They have some differences in tool types viz. Trapezes, arrow heads, rhomboids occurring in good number in Rajasthan are absent in the Mahanadi. Other associated antiquities like copper objects, stone or bone beads, various stone objects and the presence of wheel and hand made pottery suggests later date for this industry in comparison to the Mahanadi.

The credit of the discovery of Mesolithic culture in Gujarat goes to R.B. Foote (1894). Later on a number of sites were found in northern Gujarat in the Mahi (Subbarao 1952 : 34-72) and Banas valleys (Sankalia 1974 : 240). At Langhnaj in Mehsana district (Sankalia 1965 : 14) stratigraphy could well be understood. Here the mound locally known as Andhario is situated between 220-225 feet contours. Several seasons of excavation at the site have yielded varieties of antiquities. The habitational deposit is about 8 feet but the number of antiquities starts decreasing at the depth of 5 feet. On the basis of the change in colour the entire deposit is

divided into four layers. The industry is manufactured on chert, chalcedony and quartz materials and includes varieties of cores, flakes, blunted backed blades, lunates, trapeze, triangles, varieties of scrapers and borers or points. Apart from the stone tools, this site has also yielded various other objects such as ringstone or mace head, miniature ground axes, potteries, beads, metal objects, copper knife, animal bones and above all human skeletons both of male and female. While taking a note of the industry and other materials coming from the excavation, it is seen that the Langhnaj microlithic industry gives an evidence of late Mesolithic settlement and yields much more varieties of tools than those in the upper Mahanadi.

The Maharashtra is equally rich in Mesolithic settlements. The sites are generally situated on the Deccan Trap hills on the river banks and in caves and rock shelters. Some of these have provided evidence of Mesolithic habitation only while some are multi-culture sites. This industry occur near Bombay (Todd 1950 : 1-16, Malik 1959 : 15-59, Kolaba, Ratnagiri (Joshi and Bopardikar 1972 : 47-57 : and Malvan (Wadia 1975 : 141-145) and around Poona (Kosambi 1963 : 57-58). The surficial occurrences of the Mesolithic have also been noticed around the caves preserving historical relics and are Karla caves (246) and Ajanta and Pitalkhora caves (IAR 1953-54 : 39-40). A number of sites have been discovered between Nasik and Paithan on the Godavari river (Sankalia *et al* 1960 : 520). Several sites have been located around Chandarpur (IAR 1962-63 : 15), Akola, Amraoti and Jalgaon districts (IAR 1953-54 : 37). In this region some of the riverine sites like Patne (Sali 1980 : 137-160), Inamgaon (Rajaguru *et al* 1980 : 150-159) Pauni (Joshi 1972 : 43-46) and a few caves and rock shelters such as Pachad and Hathkamba (Joshi and Bopardikar 1972 : 47-57) have been excavated and yielded tools of this culture.

Patne in Jalgaon district is a classic site which has given a cultural sequence right from Middle Palaeolithic to Mesolithic (Sali 1980 : 137-160). The cultural deposit is about 2.00 m thick and consists of four layers : dark brown gravel, brown loessic silt, fossil soil and current bedded sandy fine gravel. The Patne Mesolithic industry has been divided into three phases : Phase III A, III B and III C. On the basis of techno-typological characteristics this has further been divided into early Mesolithic and late Mesolithic stages. The surface sites from the upper Mahanadi are comparable with that of Patne III A. Techno-typologically they exhibit the same character in raw material and tool types like varieties of blades, burins, points, scrapers and geometric and non-geometric forms. The blades deserve particular mention. The simple blades in both the areas are more while backed blades are less crested-guided-ridged blades which are rare at Patne, as well as in the Mahanadi region. The trapezes are quite significant in the Patne but they are

absent in the Mahanadi. The scrapers which are prominent in the upper Mahanadi valley are less at Patne. In the Phase III B a remarkable discovery is of shaped hearth. (Sali 1980 : 140) which perhaps indicates comparatively a settled life during that Mesolithic stage.

Recently an interesting site has been found near Inamgaon on the Ghod river (Rajaguru *et al* 1980 : 150-159). Here in the excavation the microlithic industry was found at a depth between 85-200 m from cross-bedded sandy pebbly gravel and brownish fissured clay. The industry comprises various types of scrapers (15), points (6), burins (3), lunates (8) triangles (7), blades (86), flakes (48) cores (11), worked nodules (13), and chips (31) fashioned on chalcedony. Among these the blades of various types (simple, blunted backed and oblique truncation) are dominant, while scrapers are subordinate. Techno-typologically this industry has been compared with Patne III A, Birbhanpur, Sangankallu and Tennevelli and shows some similarity with upper Mahanadi. Like Inamgaon, in the upper Mahanadi the blades, flakes and finished tools are smaller and thinner in size than those of the upper Palaeolithic collection. Less presence of geometric and non-geometric tools shows the similar feature. The trapezes are absent and potteries are not found in both the areas.

Many sites have been excavated in the coastal region such as Pachad cave in Kolaba district and Hathkamba rock shelter in Ratnagiri district (Joshi and Bopardikar 1972 : 45-57). At both the sites habitational deposit is 1.50 m. The excavation in the Pachad cave brought to light a microlithic industry alongwith other antiquities like pottery, coal-bits, bones of small animals like rodents and birds, iron and copper objects (though from pit). The stone age material includes scrapers points, burins, cresents, triangles, trapezes blades, flakes, cores etc. and are fashioned on chalcedony and other allied group of minerals. While at Hathkamba the excavation has yielded the stone tools devoid of any other associated material. These tools have been fashioned on chalcedony and quartz. No geometric forms have been found in the collection. The points dominate here while the blades (after flakes) are maximum in the Pachad collection. According to the excavators the microliths from Pachad cave are rather of advanced variety (Joshi and Bopardikar 1972 : 56). When we take into the consideration the Mahanadi industry, it is seen that the Pachad cave yields later antiquities whereas at Hathkamba, except points, other finished tools are numerically very less. So the comparison of these sites with that of the Mahanadi cannot be made.

A number of Mesolithic sites had been discovered as early as 1895 specially from Bellary and Chitaldurg districts of Karnataka. These sites are generally situated on the granitic rocks, sometimes on the river banks and in the pelletic laterite

(Todd 1948 : 28-30). On the basis of typology Sheshadri (1956 : 29) has grouped them in two categories. Jalahalli microlithic industry and Brahmgiri microlithic industry. Further north many more sites have been located (IAR 1962-63 : 16) among them the important one is kovalli (Pappu 1974 : 87) and Kibbanhalli (Allchin 1906 : 113-114). Recently some sites have been discovered from South Kanara in Karnataka (Rajendran in press 1982).

Sangankallu is an important site in north Karnataka which has yielded microlithic, industry in the stratified context. Besides the Mesolithic, Neolithic and Megalithic cultures have also been found in the area (Subba Rao 1949). Mujumdar and Rajaguru (1966 : 9-16), Sankalia (1969), Ansari and Nagaraja Rao (1969).

Here most of the tools are made on quartz. They consist of cores (35), core trimmings (31), parallel sided flakes (38), irregular flakes (19), Pseude parallel sided flakes (39), irregular flakes (19), Pseudo lunates (5), points (3), scrapers (3), and lunates (29). There is considerable difference between this collection and the collection from upper Mahanadi valley.

Another classic area in this state is Shorapur Doab in Gulbarga district (Paddayya 1968 : 51-117). These are mainly factory sites situated on the valleys of the Bhima and Krishna. The total collection consists of 9556 specimens among which 1098 (11.49%) are the finished tools and remaining 8458 (88.51%) are the simple artifacts. Among the shaped tools are :

| | |
|---|---|
| Retouched blades | 392 (35.70%) |
| Backed blades | 109 (9.93%) |
| Saw edged blades | 19 (1.73%) |
| Scrapers | 192 (17.49%) |
| Multiple Tools | 40 (3.63%) |
| Points | 110 (10.02%) |
| Borers | 41 (3.73%) |
| Burins | 9 (0.92%) |
| Lunates | 141 (12.84%) |
| Triangles | 5 (0.45%) |
| Trapezes | 2 (0.18%) |
| Miscellaneous | 38 (3.46%) |

This industry is manufactured mainly on the chert material and most of the tool types found in this area, found in the upper Mahanadi valley also. However, some minor differences could be noticed. The worked blades or backed blades which are dominant in Shorapur Doab area are less (31.74%) in the upper

Mahanadi valley whereas the scrapers found only 17.49% here are dominant type (34.40%) in the industry under discussion. Some varieties like points (11.30%), lunates (13.00%), triangles (1.59%) occurring in the upper Mahanadi are not much different from the types found in Shorapur Doab. The trapezes which are absent in the upper Mahanadi are represented by 2 pieces (0.18%) only in Shorapur Doab.

Though the Kerala state was regarded unhospitable for the stone age population (Foote 1914), Sankalia (1974) but later discoveries showed the evidences of these cultures in this state also. The first Mesolithic site was found in parts of Palghat and Trichur districts (IAR 1975 : 27). Later on some rock paintings and microliths were discovered from Marayur in South Kerala (Tampi 1976 : 137-144). The explorations carried out in the North Kerala yielded rich Mesolithic stations on the Ponnani basin (Rajendran 1977 : 497-502 and 1978-1979 : 129-193).

About 9 sites have been discovered in different parts of Palghat and Malappuram districts most of which are surficial occurrences on the alluvial and lateritic plains. The tool types are scrapers (153 : 50.83%), borers (35 : 11.63%) points (31 : 10.30%), burins (25 : 8. 31%), blades (19 : 6.31%) lunates (7 : 2.33%), knives (3 : 1.00%) choppers (20 : 6.65%) and discoids (8 : 2.66%) mostly made on quartz and chert. Typologically they show differences with that of the upper Mahanadi industry. Although the scrapers are the dominant feature in both the industries but they are (50.83%) here against 34.40% in the upper Mahanadi valley. Other tool types also suggest a great deal of differences in both the areas. Blades (6.31%) are very few and geometric tools are absent at these sites. The choppers which are of unifacial and bifacial variety in north Kerala are only bifacial in the upper Mahanadi valley.

In Tamil Nadu the Mesolithic industries were first discovered by Robert Bruce Foote (1916). Later on Aiyappan (1945 : 145-154) worked on Sawyerpuram collection. They were also reported from Attirampakkam area (IAR 1964-65 : 37) and near Gudiyam caves (IAR 1963-64 : 19). Although the existence of Stone Age material was established nothing was known about palaeoclimatic conditions. Zeuner and Allchin (1956 : 4-20) worked on these lines and were of the view that the sea level was higher and the climate was drier than what it is today. Recent work carried out in the area has brought to light fresh evidences on the basis of which Joshi and others (1980) are of the opinion that Tinnevelly and Kanyakumari districts experienced arid to semi arid conditions during late Pleistocene.

The Teries are situated in Tiruchendur taluk in Tinnevelly district. The sites are eleven in number and are located south and north of Tambraparni river. The industry is made on chert, limpid quartz and silicified wood. The tool types found

in them are blunted blades, scrapers (hollow, convex, concave, side, end and thumb nail) discoides, simple points, asymmetrical points, unifacial points, bifacial points, lunates, transverse arrow heads, triangles, chopping tools and cores. One of the sites of the area namely Kulattur yielded triangles and tools having no red staining over them due to which the site is regarded as later development. While comparing it with upper Mahanadi, it is observed that excepting a few types like transverse arrow heads and bifacial points all the types occur in the upper Mahanadi collection. Both the industries are aceramic and the trapezes are absent in them. A noteworthy difference in these areas is that the blade forms are less in teris than the upper Mahanadi. Regarding raw material also they show the difference. The quartz is dominant in teries while chert is in upper Mahanadi area.

Andhra Pradesh is very rich in Mesolithic cultures. This culture was brought to light by Foote (1916) and Cammiade and Burkitt (1930: 338) from Kurnool area. Later on Soundara Rajan (1958 : 50-93) and Subrahmaniyan and others 1975 : 46-85) worked around Nagarjunakonda and Issac (1970 : 191-304) around Kurnool again. Subsequently Rao established (1966 : 144-158) the presence of this culture in Nalgonda district and Reddy (1968 : 174-194). Recently some of the important sites have been excavated in the Visakhapatnam (Reddy and Prakash 1978) and Betamcherla cave areas (Murty and Reddy 1981) and have yielded various cultural remains including Mesolithic evidences. Among them are the Mallaram (Kasturi Bai and Prasada Rao 1981 : 33-42), Srikakulam (Krishna Rao 1981), Ederu river valley (Satyanarayana and Krishna Kumari 1981) and Tirupati valley Jay Raj 1981).

The site Vedullacheruvu on the Rallakalava near Renigunta has yielded Mesolithic industry which succeeds the 'blade and burin' industry. The industry is manufactured on quartz material and could easily be separated from the earlier 'blade and burin' industry which is fashioned on fine grained greenish quartzite. The total collection is of 1834 tools among which finished tools are 203 (11.20%). The tools types among shaped tools include scrapers (23), awls (24), burins (16), tanged points (7). points on core (10) and backed pieces (121) while the simple artifacts are flakes (331), blades (232), cores (104) and chips (964). The industry is aceramic and contains geometric and non-geometric tools. The backed pieces are the dominant group while the presence of awls is also significant but in the upper Mahanadi scrapers are the dominant type. It is however, noticed that a few types like choppers and knives of the upper Mahanadi are absent in the Renigunta area. Regarding the use of raw material also both the industries show some difference.

Recently an interesting evidence has been unearthed from Madhyakadaman on the Gambheeram river in the Visakhapatnam district (Reddy and Prakash 1978).

The left bank of the Gambheeram has revealed 2 m thick cultural deposit of Mesolithic (47-80 cm red soil) and upper Palaeolithic (110-197 cm pellety lateritic gravel). Both these cultural layers are separated by a sterile dull red soil having the thickness of about 30 cm (80-110 cm). Apart from the stratigraphy both the industries show techno-typological difference in size and raw material. The Mesolithic industry is fashioned on quartz against quartzite which has been used for the Upper Palaeolithic industry. The total collection in this industry amounts to 3696 tools and is divided into backed blades (135), points (79) scrapers (99) micro burins (2) borers (12) simple blades (59) flakes (257) cores (223) and chips (2830). The scrapers are the predominant type in this industry as well as in the upper Mahanadi valley but surprisingly the real burin forms are absent in the Gambheeram valley and simple blades are less (59 pieces) while burins are 2.66% and simple blades are about 23.77%. The lunates, triangles and trapezes occur here and have been grouped among the backed blades. The lunates and points are quite significant among the shaped tools in the Gambheeram valley while they are few in the upper Mahanadi valley.

Some Mesolithic locations has been discovered in the Mayurbhanj, Keonjhar and Sundergarh districts of Orissa (Mohapatra 1962 : 162). The tool types are the blades, points, lunates and scrapers. A site namely Baripada in Mayurbhanj district was excavated by Thapar (IAR 1961-62 : 36) which yielded tools below the ground from a deposit composed of gravel mixed with greenish earth and loose laterite. The tools are exactly of the same type found by Mohapatra (Sankalia 1974 : 240). On the whole these sites show very poor concentration in this part of Orissa but later work in the Tel valley (Tripathy 1972 : 217-305) in lower Mahanadi and in the upper Indravati in Koraput district (Nanda 1978), the neighbouring areas of the upper Mahanadi have evidenced rich Mesolithic stations.

Recently upper Indravati in Koraput district has been explored about 85 sites have been noticed on the hill tops, hill slopes, along the foot of the hills and on the plain rocky land. These sites, except one, are away (4-7 km) from the river Indravati and its tributary the Baskel (Nanda 1978). The artifactual material in this area display a general homogenity. Only seven representative sites are taken into consideration which represent four groups on the basis of topography. At four sites chert is the main raw material used while at remaining one the quartz. The tool types in this area are blunted back blades, obliquely truncated blades, cresents, points, notches and scrapers. The scrapers are dominant at two sites (Girla and Kotpad). The triangles and trapezes are absent at all the surface sites.

In this area Girla was excavated which yielded an evidence of about 0.50 cm made up of 3 layers. The total collection consists of 3260 artifacts. Out of which

300 (9.20%) are shaped tools while the remaining 2960 (90.80%) are simple artifacts. The finished tools include blunted backed micro-blade with oblique retouch, micro-blade with one margin retouch, blunted backed blades, points, micoburins, side scrapers and end scrapers. The excavation has also yielded 21 pieces of rubbed haematite nodules. The writer is of the opinion that "these might have been used for decorative purposes. Due to the absence of pottery and rare occurrence of geometric forms, the writer puts this industry in early stages of Mesolithic period (Nanda 1978 : 6) Although a few types like choppers, burins, borers etc. found in upper Mahanadi collection are absent here. Both the industries are aceramic and have been worked mainly on chert and occasionally on quartz. The geometric forms are rare at both the areas. Thus the upper Mahanadi Mesolithic industry is comparable to the neighbouring area of Orissa.

The Chhota Nagpur area has been proved to be very promising in stone age cultures. The part of it lies in Bihar and another in West Bengal. The existence of this culture in the area was known right from the sixtees of the last century. The better known sites are Chaibasa and Chakradharpur in Singhbhum district (Beeching 1868 : 177), near Ranchi district (Wood Mason 1888 : 387-396), Santal Parganas (Bodding 1904 : 27-31), Sanjai valley (Anderson 1917 : 349-362) near Durgapur (ASI Annual Report 1937-38) Hartopa in Singhbhum district (Murray 1940 : 79-104), in Bankura district (Chakaldar 1952 : 124-164) and Bongara in Manbhum district (Ray 1954 : 16-19). Most of the sites mentioned above are surface sites but later discoveries proved its presence in the stratified context also. At Khartosi on the Tarapheni river in Midnapur district the microliths were found *in situ* in the reddish soil (IAR 1959-60 : 48). Now some microlithic sites have also been discovered around Santiniketan area (Bhattacharya *et al* 1981 : 83-86) Previously unknown region Palamu has recently yielded some microlithic sites (Pant, Personal Communication).

An important site of the area is Birbhanpur on the bank of Damodar river Burdwan district, West Bengal. The site is fairly extensive and situated on the middle terraces of the river. A small scale excavation was carried out during 1954-1957 (Lal 1958 : 1-48). The tools here are found on the surface as well as in the excavation. They are irregular cores, free flaked cores, fluted cores, blades, points, borers, burins, scrapers and lunates. A solitary specimen in the collection is described as triangle or trapeze but according to Sankalia (1974 : 235) "the specimen is really a lunate". This industry is fashioned mainly on milky quartz but chert, chalcedony, quartzite and fossil wood are also utilized. While comparing this industry with that of the upper Mahanadi valley, it is seen that in raw material they exhibit contrasting features. On the upper Mahanadi valley, at several sites the tools are on chert while only a few are on quartz. The fossil wood

is totally absent. So far as typology is concerned, most of the types occurring here are also present in the upper Mahanadi collection. The geometric forms are almost absent in the Birbhanpur collection. The Birbhanpur microlithic industry exhibits on the whole an earlier stage than that of the upper Mahanadi valley.

Several sites have been explored and excavated in U.P. which have provided an evidence of gradual development of this culture. Apart from variation in tool types, several other kinds of evidences have come up. As early as eightees of the last century and afterwards several microlithic sites had been discovered in Bundelkhand and Baghelkhand regions (Brown 1889 : 135-136 and Smith 1906 : 185-195). Subsequently, Gordon (1938 : 22) located some Mesolithic stations in that area. These evidences were from the surface and also from cave floors. But later work by Krishnaswami and Soundara Rajan (1951 : 40-65) on the southern bank of Balia Nadi Singrauli basin, Mirzapur proved its presence in stratified position and yielded parallel sided blades, lunates and points made predominantly on limpid quartz. This is an aceramic and non-geometric industry. Recent work by the Allahabad and Banaras Universities has brought to light the richness of this industry. (Sharma 1973, Sharma *et al* 1980 : 36-37, Varma 1964, Misra 1977 : 52-57, Pal 1980 and Jayaswal and Pant 1980).

The Kaimur ranges which extend in some districts of Uttar Pradesh have developed many caves and rock shelters, contain habitation deposits and also rock paintings. A few of these have been excavated. One of the important excavation in the region is of Lekhahia in Mirzapur district (Sharma 1965 : 78 and Misra 1977 : 53-57). Here, two rock shelters and three open air settlements are excavated which have yielded identical evidences. The deposit consists of more than 1 m (3 feet) and is divisible into 9 layers and two phases. Phase I yielded non-geometric microliths (5-8 layers). While Phase II geometric with pottery. About 17 skeletons were also unearthed amongst which one is of prepottery non-geometric phase. Stone tools, ochre and weathered lateritic nodules were also found.

Morhona Pahar is another important Mesolithic settlement in this region. Both open-air settlements and rock shelters have been excavated IAR 1962-63 : 37-38 and Varma 1964) Rock shelter IV having 0.55 m thick deposit divisible into 4 distinctive layers, yielded geometric microliths and pottery.

The open-air settlement at Morhana Pahar has deposit of 1.13 m divisible into six layers. Layer six is pre-occupation while layers 5 and 5a yielded non-geometric microliths. From layer 4 onwards geometric forms occur along with pottery.

Baghaikhor site is a km east of Morhana Pahar in the Kaimur has 0.55 m habitational deposit (Varma 1965). The entire deposit is divided into 4 layers.

Layer 4 yielded non-geometric microliths while layer 3 onwards microliths are associated with pottery. A solitary human skeleton was also found burried below layer 2. At the top of layer 1 a few wheel made black-slipped sherds and two iron arrow-heads were obtained.

An important open-air settlement namely Chopani-Mando in Allahabad district has recently been excavated on the left bank of old Belan. (Sharma *et al* 1980) The site extends over an area of 1500 sq. m on the river terrace. The thickness of the habitational deposit, about 1.55 m has been divided into 10 layers. The cultural sequence is as follows :

(i) Epi-Palaeolithic : Layer 10 yielded 20% upper Palaeoliths and 80% early microliths fashioned on chert.

(ii)a Early Mesolithic or Non-Geometric Microliths : Layers 9 and 8 yielded non-geometric microliths made 95% on chert and 5% on chalcedony.

(ii)b Early Mesolithic Geometric Microliths : layers 7-4 revealed microliths alongwith triangles and trapeze manufactured on chert (90%) and chalcedony (10%), trapeze preceds the triangles.

(iii) Advanced Mesolithic : Layer 3 to 1 yielded geometric microliths (80%) on chert and (20%) on chalcedony and hand made pottery. Evidence of hutment in the form of post-holes have been found at all the stages at this site.

Ganga valley has given an unique evidence of Mesolithic settlements. The sites in this area are found to be situated on the horse sheo or crescentric type lakes. These sites are generally situated in Pratapgarh, Allahabad, Varanasi and Basti districts of Uttar Pradesh (Dutta 1971 : 500-501, Sharma 1973a : 129-146, 1973b : 106-110, 1965 and IAR 1962-63 : 32 and 1963-64 : 39-40).

Among these, the Sarai Nahar Rai has been excavated (Dutta 1971 : 500-501). It is situated on the bank of a lake. The major portion of the lake is dried but some portion of it still preserves water for 8 months. Apart from Mesolithic industry, other interesting evidences have been brought to light here. They are 8 human skeletons and 4 hearths. The skeletons were obtained in shallow oblong grave pits. Microliths and a particular type of shells were placed as grave goods. The burials are in extended position in west-east orientation, the head lying towards east. The skeletons have an average height of over six feet. The females were also comparatively tall (6 feet).

The hearths either oblong or circular in shape were also exposed. Burnt clay lumps, animal bones both charred, uncharred and microliths were recovered from

the hearths. The floor kits enclosed by 4 post holes which form a rectangle. A few hearths forming part of the floor were also exposed. Animal bones were of stag, bison, rhinoceros, fish, tortoise and shells. These animals must have served as the main source of food.

Compared with the upper Mahanadi valley the Uttar Pradesh Mesolithic industries have much more varied evidences. Both ceramic and aceramic industries occur in stratified contexts. There is also evidence of human burials which are lacking in Mahanadi area. Like upper Mahanadi valley most of the industries of Ganga valley have been fashioned on chert and a few on quartz.

From the aforesaid more or less exhaustive review of the Mesolithic culture of India, it is seen that different types of evidences have been met with by explorations and excavations of the primary and/or habitational sites. Besides the lithic tools many of the sites of this period have yielded objects like mulbrs, querns, pottery ringstone which suggest processing of raw food material. At some localities animal bones of wild as well as domesticated varieties have been unearthed from which it appears that while the wild varieties were hunted some type were also domesticated. The evidence of fire, charred bones and human burials at some of the important sites are noteworthy. The Mesolithic people on the one hand had led hunting, gathering and nomadic way of life, on the other hand they had begun comparatively settled life in some parts of India. From the recently obtained evidences from Uttar Pradesh (Pal 1980) states that "pottery in the last phase of the Mesolithic culture of the Vindhyan region which is also associated with querns, Mulers, ringstones and wild rice is just a beginning in the ceramic industry which developed and became standardized in the Neolithic period".

While examining the Mesolithic collections of India Jayaswal and Pant (1980) have distinguished several typological features and cultural phases within the Mesolithic and traced gradual development. According to them the microliths occur limitedly in the Upper Palaeolithic phase but their number increases in the succeeding period. The occurrence of triangle is almost negligible in the beginning but develops significantly in the succeeding phases. The trapezes appear rather late almost invariably alongwith pottery". They further state that "true Mesolithic phase was characterised by triangles, lunates etc. devoid of trapeze and any kind of pottery and the sites like Bagor, Adamgarh and Langhnaj yielding geometric microliths and pottery cannot be designated as Mesolithic and should be termed as Proto- Neolithic".

The cultural deductions on the basis of typological studies have certain limitations and a certain cultural levels cannot be estimated only on the basis of the percentage of a few tool types. For this other associated antiquities, floral and faunal data also have to be taken into account.

CHAPTER 5

# Post-Mesolithic Cultures

*"A fundamental change in the economic basis... the hunting/gathering communities there turned to producing their own staple sources of meat and meal, instead of simply exploiting the supply of wild foods."*

J.D. Clark 1970 : 187

In this thesis although the emphasis is on the study of Stone Age cultures and environment of upper Mahanadi, in order to present a complete picture of the archaeology of this region, it is also necessary to take a review of the so far known archaeological potential of post-Mesolithic periods. The writer has visited some of the sites mentioned hereunder and seen the antiquities in the museums. But rest of the material has been compiled from the published literature.

**Neolithic evidences**

The remains of the Neolithic period in which more or less permanent human settlements took place, the domestication of animals and cultivation of grains started are present in the area. Though no habitational site of this culture has yet been excavated a solitary neolithic celt made on schist stone has been found from the cutting of a mound near Dhamtari, situated on the bank of the Leelar a tributary of the Mahanadi (Krishna 1978). The other associated objects are the sling stones and saddle quern made on dolerite rock. The site has also yielded pot-sherds comprising coarse black ware, black and red ware, and red ware. Apart from these the noteworthy find is a burial from where the bone tools have been encountered. Due to cultivation at the site the mound is however getting damaged.

**Chalcolithic remains :**

The Chalcolithic culture is known by the presence of a few sites but no rich site worth excavation could so far be found in this area. Thus this culture is evidenced only by the surface collections. During March 1969 the exploration work was conducted around Rajim. Raipur district by the Department of Ancient Indian History Culture and Archaeology, University of Sagar. (IAR 1968-69 : 11). In the mounds on both the banks of the Mahanadi microliths alongwith the pottery were discovered. The tools were represented by arrow heads, blades and cresents while pot-sherds include black and red ware. Further work in the area may yield some more sites of this culture which will throw light not only on the Chalcolithic cultures of Mahanadi but also their relationship with those of Central India.

**Megalithic culture :**

Megalithic monuments have been found near Sorar and upto a distance of 4 km around the village as well as in the adjoining villages. The other sites are Chirchori, Karhi-Bandar, Majgahan and Kabrahat. (IAR, Annual Report 1930-34 Dikshit 1954 : 41-42). These are situated on the Durg-Dhamtari road in Durg district. They consist of (1) Stone circles (2) Menhir and (3) Dolmen. The area is very rich in these monuments, which are spread over several kilometers. The peculiar feature

of the megaliths of this area is that their several vareities are represented in the same region which is rather a rare phenomenon in Central India. The stone circles of this area can be compared with those from Vidarbha in Maharashtra.

The writer had an opportunity to visit some of the megaliths of Vidarbha and also above mentioned sites in Durg district with Prof. S.B. Deo, Director of the Deccan College Research Institute and Dr. Jamkhedkar, Director of State Archaeology Department, Maharashtra.

Professor Deo is working on the megalithic cultures of Vidarbha area with a view to trace their relationship with those of southern India and other parts of Central India.

Another classic site at Dhanora is about 3 km from Chirchori in the east. It is also situated on the Durg-Dhamtari road about 100 kms. south of Raipur district. This is a very rich site and contains a group of about 500 megaliths. Some megaliths were excavated by Madhya Pradesh Department of Archaeology under the direction of M.G. Dikshit (IAR 1950-57 : 35) with a view to ascertain their nature and possible connections with the megaliths of Peninsular India and their links, if any, with the present day aboriginals of Bastar.

Roughly the megaliths of the site are classified under four types.

Type I : It is an apsidal stone enclosure with a capstone flush on a heap of a cairn.

Type II : The apsidal stone enclosure around a menhir at its centre ranges from 5 to 7 ft. while the smaller one is 3-4 ft. in height. These are found at a distance of 6 to 7 ft. to the south of the previous one.

Type III : The alignment of apsidal stone enclosures is similar to type II and occurs in a group of five to seven.

Type IV : These are Menhirs, generally having huge proportions. They are placed by means of buttress of large boulders.

Among the above mentioned megaliths two types : Type I and Type II were excavated. In all, four Megaliths were exposed : three of type I and a solitary one of type II. In the excavation of Ist group, the apsidal enclosures limit the northern, eastern and western boundaries of the burials. The southern side is kept purposely open and encircles a burial pit covered by a cairn heap. The excavations of these pits yielded fragments of skeletal remains and some objects such as beads and glass bangles. No pottery was found from the excavation. One of the monuments

revealed a copper vessel which was traced by its outline marked in the soil but no other antiquity was encountered in it. The capstone measured 10 to 12 ft. in length, 4 to 5 ft. in width and 2 to 3 ft. in thickness.

In the excavation of second group of megaliths, the apsidal enclosures were oriented north-south and were supported by a packing of rubble and clay. The excavator is of the opinion that "they probably served only as memorials since no object associated with them was found". This excavation was of very limited nature when only a few megaliths were exposed. As such no definite conclusions could be drawn.

**Early Historical sites :**

Recently a historical site has been excavated in the north of the Seonath river at Malhar, Bilaspur district of Madhya Pradesh, by the Department of Ancient Indian History Culture and Archaeology, Sagar and Madhya Pradesh State Archaeology Department. A complete report of the excavation is not yet published but only a short announcement has appeared in Indian Archaeology—A Review, (1975-76 : 23). The excavation has yielded antiquities right from 4th century B.C. to 13th century A.D. The occupational layers are divided in four periods and have been dated on the basis of the antiquities found in different periods.

Period I. Circa 4th century B.C—2nd century A.D.
Period II. Circa 3rd century—6th century A.D.
Period III. Circa 7th century—9th century A.D. and
Period IV. Circa 9th century—13th century A.D.

**Period I :**

The period first is exhibited by the several kinds of antiquities like black and red ware of which the bowls and dishes were made and the red ware is represented by incurved bowls and bases. In the association with the potteries terracotta beads semi-precious stones, and bone points etc. have been found. This site has given the evidence of structures right from the beginning but the types of structures present in this period are difficult to identify. The dressed and undressed stones alongwith the clay were used as the building material in the period. According to the excavators the habitational area appears to have been protected by a mud wall. The purpose of the protection of the habitational area for defence or against the floods is not known.

**Period II :**

In this period the antiquities are different from that of Period I. The ceramic industry yields black and red ware, fine slipped thick ware, polished black and plain thick wares. Some of the wares possess incised decoration over their surfaces. In the potteries the worth mentioning type is a bowl of black and red ware painted with black band on the black background. This level has also revealed a number of sprinklers. Other antiquities encountered in this period are beads of stone and terracotta, bone points and dice, and antimony rod. A terracotta sealing having the legend of *ganesa Kosaliva* in Brahmi script is characteristic of 2nd century A.D. but it was found from a disturbed layer. This period has yielded better evidences of structures. The structures are made of stone and baked bricks having rammed floors. In one of the structures a thin hearth made of bricks and clay was found.

**Period III :**

The assemblage of the potteries of this period is represented by mica-slipped and golden coloured slipped red wares. Other types of important antiquities of this period are terracotta figurines (gamesmen), terracotta beads and glass beads, arrow-heads, spear heads, and nails of iron. The building of this period has *spurt* in them and have been made of both bricks and stones. The stone troughs having oval or rectangular shape found placed on the stones. These were probably intended for providing water to the cattle. Another important structure has been found for the first time in this period. This is a Buddhist temple complex erected with locally available dressed stones. An image of Vajrayana was enshrined over a brick pedestal. This complex consists of a *pradikshina* patha and three other rooms for the purpose of monks. It is assignable to the period of Somavamsi Kings.

According to the excavators "a thick deposit of ash perhaps suggests that in the last phase of this period the site was destroyed probably by the Kalchuries".

**Period IV :**

The habitational area shows that the population of this period shifted towards inner part of the town. The ceramics of this period are reported by red and coarse wares. The material of earlier period was reused in the structures. To worth mention is a brick structure of eighteen extant courses with a floor of rammed earth and stones. After the Kalchuries the site was abandoned.

Another important excavation was carried out at Sirpur on the right bank of the Mahanadi. The site is situated on the Mahasamund—Kasdol road about 40

km from Mahasamund tahsil. Around Sirpur, there are several mounds which contain archaeological remains. Some mounds were excavated by M.G. Dikshit (IAR 1954-55 : 26 and 55-56 : 26). The excavation brought to light a great Buddhist centre where the Buddhist monks were living in Viharas. Two large Buddhist places adjacent to each other situated about 1.5 km south of the well known Lakshmana temple are of great importance. These are main temple and lower monastry and have certain common architectural features (Fig. 53).

On the other site three monastries surrounded by a network of cells and spacious paved courtyard were exposed. They had foundation of stones and wall of bricks. In the central hall or in the open courtyard there used to be a jar for provision of water. One of the monastries yielded a number of shell and glass bangles and according to the excavator "this could be a nunnery". In one of the rooms was also found a stupa in crystal and gilt vajra.

A small excavation also evidenced a structure of a fort. It had revealed quadrilateral enclosure, measuring 250×220 yards. The fort walls were built of stones having breadth of about 16 ft. and height over 12 ft.

Prolific antiquities both in quantity and variety were found from the excavations. People of different professions such as agriculturists, monks and potters were inhabiting the area as is indicated by the implements. Several tools such as pincers, a pair of tongs, a small hammer, a tripod and touched stones having marks of gold testing useful for goldsmiths were recovered from a room. Many bronze images and copper plates engraved with Buddhist text were also found from the excavations.

Other associated antiquities are locks and lamps votive seals and tablets bearing sacred texts, two small images of kubera, a fine chloritic image of Manjusri, a terracotta plaque depicting a twelve-armed Avalokiteshvara and a small Chinese copper coin, circular in shape and with a square hole at the centre, ascribed to Kai yuon. The Chinese coin shows that Sirpur attracted frequent Chinese visitors. Red ware potteries were found from all the occupation layers.

The occupation at Sirpur lasted for about six hundred years (5th c. A.D.—11th c. A.D.). The occupation at this site has been divided into three periods.

Period I : circa 5th-6th century A.D.

Period II : circa 7th-10th century A.D.

Period III : circa 11th century A.D.

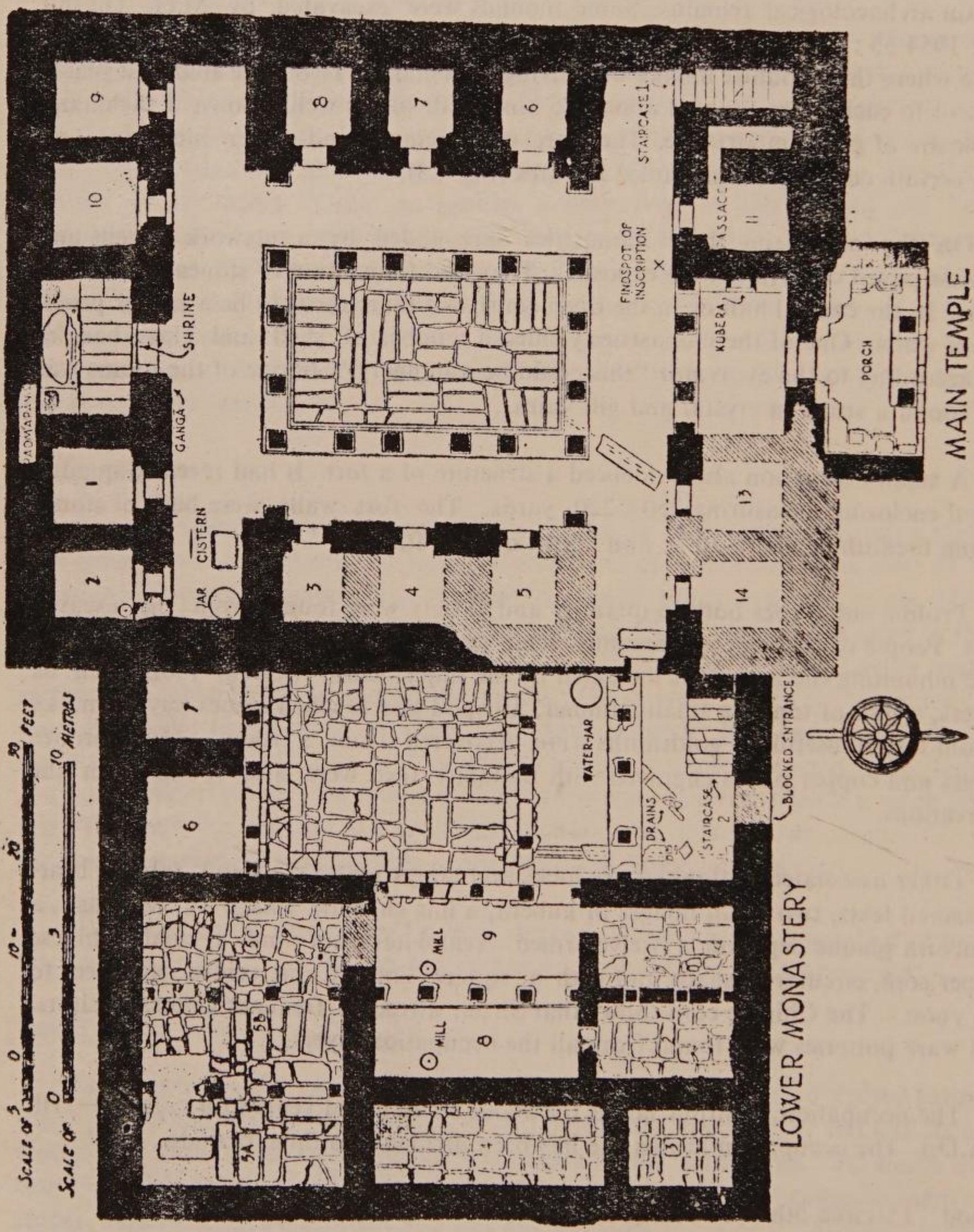



Fig. 53. An exposed monastry in the excavations at Sirpur

**Period I :**

The earliest occupation at Sirpur dates back to the last quarter of 5th century A.D. as indicated by a solitary finding of a broken gold coin of the king Prasannamatra of the Surbhaputra dynasty. The details of this period are not known.

**Period II :**

The second period starts from 7th century A.D. In this period numerous brick built buildings mainly monastries, viharas, shrines, temples and residential rooms have been unearthed. This period happens to be the Golden Age of Sirpur.

**Period III :**

This is the last period and is assigned to the 11th century A.D. It belongs to Kalchuri period as evidenced by a hoard of 106 coins of Ratnadeva of Ratnaputra. In this period the buildings were constructed of reused bricks.

In this last period the Buddhist religion probably came to an end and the people of Brahmanical faith approached the site as is indicated by the crude plaque of Shiva-Parvati, Ganesa and Mahishamardini.

Apart from these findings several temples are found around Sirpur. A few of them are very old belonging to 7th c. A.D.

A short account of the overall settlement pattern of these post-Mesolithic habitations is given on pages 435-437.

CHAPTER 6

# Interpretation of Data, Summary and Conclusion

## A. Interpretation

*"In the close and constant relations between nature and men, it is man [who always plays the most initiative part. He exploits nature the more and more purpose and in exploiting or in order to exploit it, he interferes with it. He makes it serve his ends."*

L. Febure & L. Bataillon 1925 : 13

## Quaternary Environment

As has been mentioned earlier, the Quaternary formations of the area rest upon the Granite and Cuddapah rock formations. They are characterised by gravels, sands, clays, and silts. The evidence of two aggradational phases has been noticed in the valley evidenced by two gravel deposits each followed by finer sediments.

The gravel I occurring at the base is sealed by thick finer sediments, whereas gravel II is situated at a higher elevation and is exposed at several places. The pebbles of gravel I which are sub-rounded to sub-angular, ungraded and generally moderately to poorly sorted indicate that they have been transported by a rolling motion during the short distance bed load movements. In some of the cases as at Nandghat apart from such type of pebbles, angular fragments also occur in the gravel I thereby suggesting a colluvial origin and their transport over a very short distance.

The pebbles of gravel II are smaller in size, generally rounded to sub-rounded and only a few are sub-angular. These gravels occurring at higher elevations, sometimes over the banks and sometimes away from the river, are suggestive of the movements of pebbles by turbulent floods of high intensity.

The finer alluvium in the valley is mostly sandy (sandy clay, silty sand, clayey sand, silty clay sand) (See Table 7). Sand rich sediments suggest that the alluviation in the valley has taken place by short lived floods in a near-channel environment. At Nandghat, these sediments occur in the form of fine bands indicating that they were deposited in a stagnant pool environment. The river Seonath has developed sharp meanders throughout its central and lower course due to some changes in the past thereby causing ox-bow lakes where the same type of deposition could be formed. But this could not be traced during the present study.

The sediments are slightly acidic to alkaline varying in pH from 6.8 to 8.3 with traces of carbonate. These chemical properties indicate moderate to strong leaching conditions in the post-depositional periods. The contents of organic matter content (as well as organic carbon) are also low which suggest that after the deposition of the sediments they were exposed to atmospheric weathering in which oxidization of the sediments had taken place.

The sediments being moderately sorted have been laid down by the monsoon-fed rivers. These are mostly in shades of brown which is also suggestive of oxidization and formation of limonitic iron either due to weathering or to alluviation in sesquioxide horizon may be the result of both humification and weathering. The

reddish colour indicates presence of unhydrous iron or hematite in soil profile (Butzer 1971 : 85).

The alluvium of the area is generally loose in nature due to negligible (0.2%) amount of $CaCo_3$, excepting at some places where it is moderately compact and laminated. The presence of kankars is regarded as an indication of a semi-arid environment. (Flint 1963 : 123-129). Nettarbarg (1969 : 117-122), on the basis of his studies of the South-African calcretes, observed that the kankars generally occur in the rainfall zone of 550-800 mm per annum and the areas receiving less than 550 mm rainfall develop hardpan calcretes. Weinert (1976 : 133-140) is of the opinion that the areas receiving more than 800 mm rainfall do not develop kankars at all. Mason and others (1959 : 566) have however disputed such conclusions and have shown how the variation in number of factors results any type of formation. Thus the formation of kankar bands alone cannot be taken as an indication for a particular type of past environment. In India kankar formations have been reported in the semi-arid as well as sub-humid regions (Supekar 1968 : 423-75) (Ahmed 1966 : 57-64), while they have not been noticed in humid regions (Medhi 1980 : 115). The occurrence of calcium carbonate in the different regions is given below.

| *Regions* | *Climate* | *Calcium Carbonate* |
|---|---|---|
| Hiran valley (Saurashtra) | Semi-arid | 89.3-95.7% |
| Mula Mutha valley (Maharashtra) | ,, | 0-1.09 |
| Mahanadi valley (Madhya Pradesh) | Sub-humid | 0-0.2% |
| Garo Hills (Assam) | Humid | Trace |

In the semi-arid tract of Saurashtra (Marathe 1977 : 216) it has been noticed that in the source region of the Hiran river where the rainfall is very high (1525 mm per annum) kankar nodules have been noticed but in areas of less rainfall (635 mm) they are abundant. The neighbouring Narmada basin also falls in to the sub-humid region and the rainfall is equally high (Hoshangabad—1294 mm, Narsinghpur—1300 mm, Jabalpur—1274 mm per annum) but surprisingly, whereas thick kankar bands (226′ thick at Karali) are present in the valley of the Narmada, only a few smaller nodules could be noticed at some places (at Arjuni) in the upper Mahanadi valley. If we assume that dry phases prevailed in the Narmada during the formation of late Pleistocene alluvium, the Mahanadi could also have expe-

rienced the same climatic conditions. In the present state of our research only two possible explanations can be offered for such variations in the above said two regions :

(1) The Mahanadi flows over granitic and Cuddapah rocks in contrast with the Narmada which flows over the quartzite rocks of the Vindhyan series and the basaltic rocks. The absence of the kankars in the alluvium of the Mahanadi may be due to the presence of highly silicious rocks.

(2) The alluvium of the area is dominated by sand particles of various sizes from top to the bottom due to which in the sub-humid region of the Mahanadi where the rainfall is quite high (1300 mm per annum) downward leaching of the carbonate must have taken place from the upper part of the profile and it was not precipitated forming firm kankar bands.

The laterite is an important geological formation. Apart from its economic value it also throws some light on the past environment. In India, laterites have been found at various levels along the west coast and have been distinguished as 'High level' and 'Low level' laterites. They also occur inland, the best exposure is at Bidar in Andhra Pradesh (Joshi *et al* 1981 : 67-94). In the upper Mahanadi valley, the laterites have been developed on the plains and have been noticed in the vicinity of shale rock of Cuddapah group. The formation of laterites in India took place right from the beginning of Quaternary and the low level laterites have been dated to the early Pleistocene. However no firm dates of laterite have yet been worked out. Fox (1923) opines that "it may be pliocene or even older or post-Tertiary age (Pleistocene), or somewhat later and it is possible that laterites may still be forming at the present day". According to Maignien (1966) in the intertropical regions of South America, Africa, India and Southeast Asia laterites are forming even today.

Opinions are divided on the origin of laterites but generally the laterites are formed due to pedozenic and ground water processes under humid tropics characterized by wet and dry phases with heavy rainfall, high temperature and abundant vegetation leading to the accumulation of sesqueoxide of iron by capillary action and the relative downward removal of silica which are characteristic features of humid tropics (Twidale 1976 : 6 and Goudie 1973).

In the upper Mahanadi valley nowhere laterites have been noticed in any stratigraphical context. They were seen at 4-5 m depth from the surface but their lower limit has not been encountered so far. At Pujaripalli the laterite has been overlain by gravel-II and at Macheva microliths are found over the lateritic surface.

In the present state of our knowledge it seems that the laterites in the area were formed prior to the deposition of Gravel-II which is associated with the Upper Palaeolithic tools. Thus the occurrence of laterites shows that during the Quaternary the Mahanadi valley was experiencing sub-humid climate characterised by wet and dry phases with minor fluctuations which took place from time to time in the past under overall monsoonic character of Indian climate.

Most of the major rivers of Peninsular India have been systematically explored and have yielded faunal evidences alongwith the cultural material. These fossils are very important for relative dating of the industry and alluvium as well as to understand the vegetation and climatic conditions of the past. The fossils in association with cultural material have been found in the Narmada valley. Badam (1976) who studied the faunal assemblages from the valley suggests that the valley was a vast savannah land punctuated by flood plain lakes and swamps. In the Ghod valley in the Godavari basin (Kajale 1979 : 132-138) both the sedimentary characters and fossil evidences have been taken into consideration for building up the palaeo-environment. These studies show that the plateaus and low lands of the valley must have been covered with a series of pools and tall grasses in a tropical semi-arid savannah type of environment with warm monsoonal climate. In the Manjra Valley the fossils are dominated by herbivores and reptiles which indicate good vegetation cover in the savannah forests and abundant sources of water in the channels of Manjra. The climate in the valley seemed to be more-humid than that of today (Joshi *et al* 1981 : 67-90).

In the Kurnool caves in Andhra Pradesh the fossils of several species have been encountered. In them a few fossils are domesticated forms but most of them are now extinct in the area. Some animals like antelope, cervidea even now inhabit the forests of the adjoining area. Murty (1975 : 132-138) opines that due to human interference with the nature, the vegetation of the area must have become scarce and the animals would have been forced to migrate to the neighbouring regions. The faunal wealth and chemical analysis of the sediments support the idea that during the late Pleistocene the climate must have been relatively more humid.

As detailed earlier in the upper Mahanadi valley the faunal material of *Bos Equus* and *Ovis/Capra* species has been found alongwith the Middle Palaeolithic tools. At present it is very difficult to understand the exact nature of the climate and ecological condition during Middle Palaeolithic times in the upper Mahanadi valley. However, some attempts have been made in this direction on the basis available faunal material. The fossil evidences show that some of the species have now become extinct (*Equus caballus*, *Equus namadicus* and *Bos namadicus*), and some of them are still found either in the forests or have been domesticated (*Bos*

*indicus* and *Ovis/Capra*). These species are indicative of ascrub type of vegetation of wooded grassland probably savannah forests and hard ground surrounding watersheets in the valley. Thus when the alluvial plain of the upper Mahanadi and the Seonath was covered with thick vegetation, varieties of animals must have roamed freely. At the present the wild animals occupy hilly terrain due to destruction of the vegetation in the plain. The deterioration of the forests might have taken place due to the interference of human agencies.

While the Mahanadi river appears to be extraordinarily matured its master streams show incised or gullied banks. This kind of rejuvenation may be due to the renewed erosive power consequent upon forest destruction (Spate 1954 : 767). The Mahanadi and its tributaries have developed a vast plain. However, the main river and its tributaries show different characteristics of deposition. Goudie (1977 : 18) states that "response of a stream in terms of load and discharge to changes in climatic variables will be influenced by vegetation cover, slope angle, the range of the altitude of the basin and other circumstances. Thus the change in any climatic factor within one area might lead to different responses in different streams and even in different segments of a single stream". The Mahanadi is very wide (extending to 1-2 km in width) in its upper part with flat river bed and low banks. The geomorphological characters of the rivers suggest that they were overloaded and frequently had turbulent and torrential floods of high intensity due to which river banks have been eroded and show less alluviation along the main rivers whereas a heavy blanket of alluvium has been piled up along the tributaries.

Peninsular India is regarded tectonically unstable and was subjected to anticlinal warping in NNE-SSW direction due to which all the rivers of Peninsula have been affected and at several places knick points have been developed (Vredenburg 1906 : 41). Due to these disturbances the rivers have caused extensive erosion in some places and accumulation of thick alluvium in others. Rajaguru (1970 : 190-229), who has studied the geomorphological aspects of the land surfaces of different elevations and aggradational and erosional phenomena of the Deccan rivers, has recognised various developments caused by tectonic activity or climatic fluctuations. These features include policyclic nature of the landscape, the western ghat scarp, the presence of peneplains at higher elevations, the presence of water falls, superimposed and rejuvenated characters of the streams and entrenched meanders at a few places. According to him these disturbances were active right from the late Cenozoic and continued in the later periods also. To some extent the Deccan Peninsula appears tectonically still unstable and experiences periodic earth movements as was indicated by the Koyana region earthquake of December 1967 and October 1980.

On the basis of the observations of the long profile Vredenburg (1906 : 42) has recorded some evidence of tectonic disturbances in the Mahanadi valley. He states that "the profile of the Mahanadi differs nevertheless to some extent from the normal area of denudation steepening of gradient takes place at some distance from the sea as expressed in the diagramatic profile by a bulge above Sambalpur is due to the same warping that caused the deposition of the ancient alluvium in other valleys or whether as in the case of the African rivers, it is a general feature amongst the Indian Peninsular rivers, indicating general rise of the peninsular platform relatively to the sea level and independent, perhaps from the more complicated warping that has caused the formation of the rock basins, is a question for the investigation of which sufficient data are not seem to be available. At any rate, all these changes agree in showing that very extensive though moderate disturbance has affected the peninsula at a late period previous to recent times."

The Mahanadi and its major tributary Seonath flow parallel to each other for a long distance and at several places they suddenly change the directions of their courses. According to Twidale (1976 : 434) such disturbances take place due to earth movements. The Mahanadi is braided in its middle and lower part and has a shallow nature throughout its stretch. The braided channels are the characteristic features of sub-humid landforms and might have been developed when the river had an erratic discharge of water and carried a coarse load of sediments. On the other hand the Seonath has developed entrenched meanders in the central and lower reaches and valley incision has taken place into late Pleistocene alluvium. These features do suggest tectonic unstability (Corvinus *et al* 1972, 1973 : 53-69, Rajaguru 1970 : 190-206).

The neighbouring areas such as the Narmada and the Son have also been studied from the geomorphological point of view. West (1962 : 143-144) has pointed out active tectonic elements between Narmada and Son right from the pre-Cambrian times and had their influence in the subsequent geological periods. Two surfaces of about 1950′ (higher) and 1450′-1200′ AMSL have been recognised in the Katanji area of M.P. to the north of Narmada (Choubey 1967 : 166-170), while to the south of the river some arched-up surfaces are noticed. The lower surface rises towards Pachmarhi whereas higher surface is dissected and its remnants are the isolated peaks of Dhupgarh (4429′) Mahadeo (4359′) and Chauragarh (4303′) Dixey (1970) thinks that the surfaces noticed across the faults must have been developed due to tectonic disturbances. Several plateau surfaces mainly the Pendra plateau (900 m). Lormi plateau (362 m), and Parasgaon plateau (743 m) have also been noticed to the north and south of the upper Mahanadi valley but to understand their origin further work is necessary.

The changes in the lower reaches of the river affect the upper part also. In the lower part of the Mahanadi they were mainly controlled by sea level changes. The morphological study on the eastern sea coast by Niyogi (1970) revealed the sea level changes in the past. He recognised a series of ancient beach-ridges and off-shore bars on the basis of which five positions of eastern shore-lines close to the Mahanadi have been made out. These features reflect a low sea level perhaps 25000 years ago. On the basis of 1000 borehole data from Visakhapatnam and also based on the geomorphological work Pridhvi Raju and Vaidyanadhan (1977 : 18) have inferred high and low sea levels during the Holocene times.

**Settlement patterns :**

Muller Wille (1954 : 141-163) has recognised five types of settlements based on the duration of site occupation as under :

(a) Ephemeral settlements of a few days duration
(b) Temporary settlements of several weeks duration
(c) Seasonal settlements of some months duration
(d) Semipermanent settlements of some years duration
(e) Permanent settlements lasting for several generations.

In the upper Mahanadi valley, sites dating from Lower Palaeolithic to Mesolithic cultures have been traced and material in the form of stone artifacts has been collected. Since no site in this area could be excavated due to lack of suitable habitational deposit, that nature of settlement has been estimated on the basis of the collection of the tools and the area covered by the site. Although a few caves and rock-shelters are present in the area none of them has yielded any cultural deposit. This perhaps shows the absence of permanent or semi-permanent prehistoric settlement. The ephemeral, temporary and seasonal settlements seem to be more frequent in this area.

Of the 45 sites discovered three are of Lower Palaeolithic, five Middle Palaeolithic, four Upper Palaeolithic and the rest are of the Mesolithic cultures. In them three localities are multi-cultural sites where Lower Palaeolithic as well as Mesolithic tools have been obtained. At Singa both the Upper Palaeolithic and Middle Palaeolithic industries have been found and their stratigraphical positions and the distributional areas of each culture are different. Excepting these all others are single culture-sites.

Most of the sites lie on the right bank of the rivers. These are sometimes situated close to the main rivers. In some cases they occur on the bank of

nalas and are away from the main channels. The majority of the settlements, particularly the Mesolithic, are concentrated on the Mahanadi proper. Those on the tributaries are sparse and widely scattered. The settlements in the valley may be distinguished into three landform categories as follows :

| *Nature of sites* | *Lower Palaeolithic* | *Middle Palaeolithic* | *Upper Palaeolithic* | *Mesolithic* |
|---|---|---|---|---|
| A. Foot hill and hill slope sites | + | + | — | + |
| B. Gravel sites | — | + | + | — |
| C. Table land sites | — | — | + | + |
| D. Cave and rock shelter sites* | — | — | — | + |

*In the small caves of the area no tool-bearing cultural deposit has been encountered. However, some tools of the Mesolithic have been found on the bare rock surfaces over the floor of the caves.

The Palaeolithic sites lie far apart from each other over a large area but the Mesolithic sites are closely spaced. The latter sometimes occur as clusters within a km. Generally the Palaeolithic sites are smaller in size whereas the Mesolithic sites are extensive and show a larger concentration of the tools. A few sites of the Upper Palaeolithic are equally rich and cover larger areas. All the sites of the area are openair stations occurring in association with the gravels or are situated on the rock surfaces. As has been mentioned earlier, there are caves and rock-shelters in the area which are ideal places for prehistoric habitations but no cultural deposit has so far been encountered in them. All the sites are situated in the areas where early man could have had access to natural resources for exploitation due to favourable ecological settings.

On the basis of archaeological evidences and the location of sites on the various landforms we can infer the nature of the relationship between land and man during upper Pleistocene times. The Lower Palaeolithic sites in the upper Mahanadi valley are situated on higher levels generally on the hill slopes away from the present river course. Even in earlier times the rivers of the region were subjected to floods the records of which are preserved in the form of gravels in the Jonk river underlying the thick alluvium which were seen exposed in the cuttings of a dam near Arjuni. Another gravel near Champa is exposed about a metre above the present river bed.

The Lower Palaeolithic stations are generally found on the hills covered with jungles which still preserve some kind of animal life and tribal communities.

There is strong reason to believe that during subsequent Middle and Upper Palaeolithic times the environment underwent modifications. The evidence of associated animal fossils shows the existence of grassland and open type of forests. This, however, does not necessarily mean the change in climate. It is quite possible that during Lower Palaeolithic times the man had penetrated in the thick forests during somewhat humid climate in search of animals and vegetarian food. A comparatively drier phase then ensued which caused a shift in the vegetation from wet deciduous to dry deciduous forest. Man of this period had the access to settle near the banks of the rivers and to exploit the raw material of chert and other silicious variety minerals which were available in the river gravels.

Although it is premature to make any estimate of population of these Palaeolithic periods, on the basis of number of sites and the quantity of cultural material in the form of stone tools obtained in the valley, it may be reasonably stated that the Lower Palaeolithic population was extremely small in the valley. As far as the availability of raw material is concerned, which is the prime necessity of the man of that period, it was available in plenty. Moreover the region did not have any major physical barrier to prevent movement of Palaeolithic people from the adjoining Narmada valley in the Mahanadi region. The reasons for very meagre occurrence of Lower Palaeolithic habitations are not yet known.

The Middle Palaeolithic people continued the technological tradition of the preceding Acheulion cultures as is evident from the occurrence of small ovoid bifaces found in association with the Middle Palaeolithic industries. Interestingly the tools of earlier culture were manufactured on the quartzite and dolerite dyke material whereas in later culture they are fashioned on chert and allied minerals. With the depletion of the earlier thicker forests the Middle Palaeolithic and Upper Palaeolithic people could move more freely in the extensive Mahanadi plain to set up their camps at favourable spots where the chert-bearing gravels were available nearby.

The close of the Pleistocene and beginning of Holocene do not seem to have brought about any environmental changes in the upper Mahanadi area. The Mesolithic habitations also occurred more or less in the same areas which were previously occupied by Middle Palaeolithic and Lower Palaeolithic cultural groups. However, no Mesolithic site has so far been encountered along the Seonath river which is rich in Middle Palaeolithic and Upper Palaeolithic sites. The majority of the sites are situated on the Mahanadi proper but some have also been located on the Hasdo

and Jonk rivers away from the Seonath and therefore it shows that the Mesolithic habitants moved to other areas as well. These Mesolithic stations are situated between 700 and 1300 ft. AMSL on the slopes of granite and quartzite hills or at the bases and sometimes also on the flat rock surfaces. A few among them occur on the alluvial and laterite plains. The clusters of this culture in places cover nearly 400 sq m whereas some are spread over very small (4 sq m.) area.

The increase in the number of sites during Mesolithic period perhaps indicates increase in the population. And due to more human activity and interference with the nature in the Seonath valley the natural vegetation must have got destroyed thus denying enough food to the increased population. The Mesolithic population was therefore forced to settle in the hilly areas where pockets of vegetation and animal games were still in existence besides the limited perennial water supply.

In the recent times due to lack of sufficient vegetation cover and rapid erosion of the soil from the rocky surfaces the tall grasses have disappeared and the natural vegetation is almost destroyed exposing the underlying rock surfaces. On the whole there does not seem to have been any marked diversification or preferential occupation of certain areas during the Palaeolithic and post-Palaeolithic times.

Some intensive ethno-archaeological studies are being conducted by scholars of Deccan College in the Bastar area adjoining to the Mahanadi region (personal communication) in spite of detailed studies the correlation between the Palaeolithic and Mesolithic sites with existing tribal settlements have not properly been understood. As is commonly observed in all types of early human settlements the tribals also have their habitations near the water bodies close to the jungles where they can meet their demand of food and water. None of the tribal groups in the Bastar area are utilizing stone implements of palaeolithic types in their domestic or hunting needs. As such to understand the function of various tools of Palaeolithic and Mesolithic cultures, the study of the present tribes does not seem to be of much use. If at all any comparison of these tribal people has to be made with the prehistoric inhabitants of the Mahanadi area then we can say that both does not seem to bother permanent sophsticated structures like houses. Infact many of the tribals prefer to occupy the natural shelters like caves or rock shelters which are readily available in the area.

Some account should also be given of the settlements of the Post-Mesolithic period in the Mahanadi valley. Two sites belonging to Chalcolithic and early historical periods have been excavated on the right bank of the Mahanadi respectively at Rajim and Sirpur. The site at Sirpur is also in the vicinity of a site yielding Mesolithic material. Similarly an early Historical site has been recently discovered

at Sonepur (Sankalia 1980) on the right bank of the Mahanadi and at the confluence of Mahanadi and Tel river in the Sambhalpur Phulbani regions. At this locality also there are evidences of cultures of earlier stone age periods. In the case of Megalithic monuments it is seen that they are generally situated near the hills and are somewhat away from the permanent water bodies where no Stone Age cultural material has been found at any of the Megalithic sites. In this regard they show different settlement pattern from those of the Vidarbha Megaliths. In the vicinity of each Megalithic site of Vidarbha Megalith cultural material or Stone Age has always been found. (IAR 1958-59 : 21-22; 1961-62 : 32-34, Pandey 1981 : 223-230 and Pandey in press). Since the sites of post-Mesolithic period are very few, no general pattern of settlement can be made out. The sites at Rajim and Sirpur are riverine localities and had an advantage of intensive fertile land for the purpose of cultivation and pastoral activities.

The Palaeolithic communities of upper Mahanadi belonged to hunter-gatherer groups. It would be tempting to identify their activity areas as kill and butchering sites. Such attempts have been made by Silversten (1980 : 423-441) on Palaeomedian sites taking into consideration the bone material and stone artifact clusters from various sites. Although upper Mahanadi area has fairly large number of tool-clusters, in the absence of bone material such study is not possible. But the dominance of scrapers in the Middle Palaeolithic sites is clear indication that such sites were butchery and processing sites.

**Subsistence Patterns**

Braidwood (1960) and Braidwood and Howe (1962 : 132-146) have proposed an economic classification of prehistoric cultures based primarily on cultural material as well as on the levels of subsistence. They have classified it in three groups :

(a) Unspecialized food collecting
(b) Specialized hunter gatherer
(c) Primarily food producers.

Considering the cultural material and also the insufficient data no definite deductions can be made about the nature of subsistence patterns of the upper Mahanadi valley. But it may not be out of place to record some of the evidences like animal fossils and the nature of the present day fauna and flora which give some glimpses of the subsistence patterns of the prehistoric inhabitants of the region. The distribution of the stone age sites in relation to the geomorphic settings of the area has already been detailed earlier.

From the predominance of the fossils of wild horse and cattle the land-scape as a whole appears to have been clothed with wooded grasslands. Hole and Heizer state that "Cattle were originally restricted to wooded areas whereas horses as well as antelopes preferred relatively flat open grassland (1973 : 330). Taking into consideration the tools of all the stone age cultures the prehistoric population must have been sustained on the hunting and products of natural vegetation. Unfortunately no pollen data are available from the upper Mahanadi valley to gauge the past vegetation patterns.

The rivers have now developed extensive plains sometimes covered with grassy and scrub type of vegetation while hilly areas preserve vast forests with thick vegetation cover. The vegetation in the prehistoric times was so rich that it was able to provide sufficient food during famine and natural break off that occurred time to time in the past (Elevin 1946 : 166). For the neighbouring areas of Bastar Grigson states that "famine has never been a problem in Bastar as the Maria and other tribes have always been able to draw half of their food supplies from the innumerable edible products of the vast forests" (1938 : 151).

The valley is full of tribal communities who still lead primitive life and are mostly hunters and food gatherers. The life during the prehistoric times must have been more or less the same as is of the tribal people today. There are certain elements of prehistoric ways of life preserved by the tribal people who often live in the jungles and somewhat interior places and have the semi-hunting and relative non-dependence on agriculture. The tribals being 'children of nature' their life exclusively depends on the physical environment in which they live (Saigal 1951 : 148). In the upper Mahanadi valley the present day tribals mostly live in or around the forests and generally occupy the foot hills, hill slopes, patches of plains between hills and hillocks (Prasad 1951 : 138). There are several varieties of tribes such as Gonds, Halbas, Parjaj, Bhatraj, Kamar, Bhunjia, Saura, Bijhdar, Baigas and Uraons and are further divided in several sub groups. Gonds are the dominant tribe of the area due to which the area in the ancient times was called as Gond Kingdom (Allchin and Allchin 1968 : 38). In the recent times some of the tribal communities are settled and have adopted agriculture partly, but a few of them are purely nomadic and change their camps frequently. Their main weapons are bows and arrows, sticks, stones, traps, nets and snares of varying sizes and shapes for all types of game and they are expert in their use. Arrows and spears are generally whipped with pointed iron tips. For poisoning arrows and spears they use the crusted seeds of the *Abrus precatorius* : *Shrub*. Nowhere stone tools have been seen to be fitted at the top of the arrows and spears (Allchin 1966 : 79).

Although the archaeological deposits in the upper Mahanadi valley do not provide much evidence to shed light on the exact early subsistence patterns the

meagre fossil finds and present day wild fauna and flora have therefore been taken into consideration to build up tentative subsistence patterns of the prehistoric past.

The vegetarian diet of the prehistoric people must have been the forest products in the form of edible fruits, roots, tubers and seeds. The prehistoric vegetation and subsistence means can be estimated on the basis of the fossils of existing natural vegetation. However, the vegetation must have contained plentiful and more varied supply of plant food than those of today (Paddayya, 1978). The details of present vegetation have already been given in Chapter 1B. While exploring the archaeological remains of this region the writer came across several species which play an important role in the vegetarian diet of the tribal people and a few of these are given here.

The young green shoots and pith of the bamboo are great delicacy. They are prepared by removing the outer skin followed by boiling and frying in ghee or oil. Varieties of roots are also collected for the means of subsistence and common among these are *Kunhia* and *Kanda*. The popular kandas are *kirch, kundru, jalia, sua* and *saidu*. In early rains (July-August) khudrati or bara fingers and mushrooms are sought. Varieties of wild plants are gathered for vegetable. On the top of all certain wild grasses are collected the seeds of which are eaten. The khapani, a wild bearded rice, common in all old rice fields, generally grown at the edge of the standing water is the main seed to be eaten.

The cultures starting from Lower Palaeolithic to the early historic periods survived in the valley due to availability of sufficient food resources. In India the prehistoric deposits are rather poor in the evidences of pollen remains. In the beds of former salt lake in Rajasthan the plant remains have been met with and dated to 7500-3000 B.C. (Singh *et al* 1974 : 467-501). This evidence points out the likelihood of cereal cultivation and extensive scrub burning combined with Cerealia pollen. The cultivated cereals have yet to be recorded from the archaeological sites of this period to reach at any definite conclusions.

As has already been discussed the valley has provided fossil evidences (Chapter 2B) and also existing rich wild and domesticated fauna (Chapter 1B) in the plains and forested regions of the valley which includes large and small games such as mammals, rodents, birds, reptiles, equatic animals and insects. Of these, there are several varieties which are eaten away even today. (Grigson 1938 : 151-168, Thakkar 1950 : 41-99, Elwin 1949 : 200-205, 1939 : 78-99 and 1946 : 255).

Most of the mammalian fossils and evidences of rodents, reptiles and aquatic animals mentioned earlier have been encountered from the Pleistocene and Holo-

cene deposits alongwith the stone age artifacts of Lower, Middle and Upper Palaeolithic cultures on all the main peninsular rivers like Narmada, Godavari, Manjra, Krishna and Ghod and at some of the important sites like Kurnool caves (Murty 1974 : 196-230 and 1975 : 132-138) Adamgarh (Joshi and Khare 1966 : 90-95 and Joshi 1968 : 245-254) Langhnaj Clutton Brock 1965 : 3-38) Tilwara and Bagor (Misra 1971 : 59-79).

The occurrence of fossils along with the cultural material suggests that the early man had a plentiful supply of wild and in later periods domestic animals throughout the pleistocene and Holocene. Regarding Mesolithic cultural groups, Thomas (1975 : 327) advocates that "the economy of these people was mainly based on animals both domesticated and wild and they also exploited aquatic animals like tortoise, fish, frog, rat, hare and mongoose and were self sufficient in their economy". Nowhere the remains of insects have been unearthed from Palaeolithic and Mesolithic excavations, probably due to non-favourable climatic condition for their preservation.

While summarizing, it is necessary to emphasize that by and large the economy which was hunting and food gathering, had not undergone change during the span of nearly one to two lacs of years. The type of animals hunted must have varied from one period to another. This statement also will be rather an over simplification because faunal and floral data of the past of this region are extremely limited. Excepting the fossils found in association with the Middle Palaeolithic tools there is absolutely no evidence of support of the existence of a particular type of animal life. The deduction regarding the subsistence patterns will have therefore to be gleaned from the typology of lithic industries of different periods.

Other handicap of the region in the present study, is the total absence of evidence about the type of humans existed at different periods. The deductions about the subsistence pattern and cultural change therefore will have to be considered with these limitations.

## B. Summary and Conclusions

In the beginning of this thesis I had stated the necessity of micro-regional studies in a vast country like India where its potentialities are known only in very broad ways. In fact what we know of the prehistory of India is the sum total of all such small efforts by several scholars. Upper Mahanadi is a small area but is situated on a "*Maha*" river and the above detailed archaeological study has aptly proved that the region had a long history. To some extent the environment was responsible in the early habitation/settlements in this valley, for example the influence of geology is apparent in the location of the Middle and Upper Palaeolithic sites.

The intensive study of the region has also brought out the evidences of Quaternary alluvial processes. Several sections containing coarse and finer alluvia resting over the sedimentary rocks have been noticed and the palaeontological finds have completed the picture of the ancient prehistoric grass lands of Savannah type. The laboratory studies of the soil samples collected from the sections show that the area had perhaps fairly high rainfall in the prehistoric past and the sediments are mainly flood deposits of the monsoon fed rivers. They are slightly acidic to moderately alkaline and contain traces of calcium carbonate. Various studies in the region however indicate that there was no major climatic change since upper Pleistocene times.

The Lower Palaeolithic sites are sparingly distributed in the area in the Mahanadi valley situated generally at the foot and slope of hills either close to the river or little away. This assemblage shows different characteristics of the Lower Palaeolithic industries of Madhya Pradesh. The sites of this region yield chopper assemblage and show another pocket of Pebble industry. The raw material for these industries was mainly dolerite and quartzite while in other regions in Central India it is quartzite and rarely granite. Typologically this evidence is similar to the Tel valley where it has better stratigraphical control.

Whereas the Lower Palaeolithic sites are surficial occurrences the Middle Palaeolithic tools are found in the stratified context. They come from the gravel I, stratigraphically below, at the water level and sometimes 0.50 1 m above the river bed. Alongwith these tools are found the animal fossils of *Bos*, *Equus* and *Ovis/ Capra* species which have helped for dating this industry to the late Pleistocene. Excepting one, all the Middle Palaeolithic sites are situated on a tributary away from the Mahanadi proper. The presence of bifaces in this industry shows its late Acheulian character although the assemblages are distinctly Middle Palaeolithic. The handaxes and cleavers are absent in the Lower Palaeolithic.

The Upper Palaeolithic sites are concentrated only on the Seonath river. They occur in two different environs sometimes associated with gravel II and sometimes spread over the flood plains. They show a development from Middle Palaeolithic and further to Mesolithic. The tools of this culture are associated with the fresh water molluscan shells. The radiometric dating of these shells could not be done due to small sample. The proportion of the blades and the tools fashioned on flake-blades suddenly increases in this culture and some microlithic forms like lunates appear.

It would be interesting to note that whereas the Seonath has yielded the richest Middle Palaeolithic and all the Upper Palaeolithic stations, no Mesolithic site has been located along this river. The maximum number of sites occur on the Mahanadi proper and two each on the tributaries namely the Hasdo and the Jonk. The open air stations of this culture are generally situated on the rocky surfaces, the slopes and the foot of the hills. A few sites have also been located on the alluvial and lateritic plains. At a solitary site the tools have been found *in situ* on the right bank of the Mahanadi river alongwith the molluscan shells. The geometric implements are few in the collection and are represented only by triangles. The trapezes are altogether absent in this collection. The absence trapezes and the pottery suggests that the Mesolithic industry of the upper Mahanadi valley rather belongs to the early phase of the Mesolithic culture.

Considering all the cultural data together it is seen that the cultures starting from Middle Palaeolithic to Mesolithic do not have much difference with those found in most other parts of Madhya Pradesh. In the Indian sub-continent generally two types of Lower Palaeolithic industries occur Pebble tool industry and Acheulian handaxe industry. Generally Acheulian industries occur in most of the regions but there are several areas like Himachal Pradesh, Assam and Western ghats where only Pebble industries have been observed while handaxe industries are totally absent. It should however be mentioned that even in the classic Acheulian

areas the Pebble industries are also present. Among those the mention may be made of Lahchura, Tel valley, Nittur and the upper Mahanadi valley. Thus the Lower Palaeolithic industry shows a completely different picture from that of the other sites of Madhya Pradesh and in this respect it could be compared with the Tel valley in Orissa, Nittur in Karnataka and Lahchura in Uttar Pradesh.

The Middle Palaeolithic industries of the upper Mahanadi have identical features like other classical sites on the Narmada and Wainganga. All these industries belong to medium size gravel and yield small bifaces alongwith other important tool types. The Narmada and the upper Mahanadi industries have given the evidence of animal fossils from this horizon belonging to upper Pleistocene. The Upper Palaeolithic culture which is known by only a few typical sites in Madhya Pradesh does not show much difference. This industry occurs in upper horizon than that of the Middle Palaeolithic and is generally associated with the gravel II as seen in the Mahanadi and the Wainganga valleys. Some other sites like Bhimbetka, although situated in different environs and utilizing other raw material do not exhibit much typological variation excepting in the size. The Mesolithic industries found in varied geomorphological situations in Madhya Pradesh are very rich in the upper Mahanadi valley. They are generally surface scatters and only a few tools have been found in the naturally formed shelters of the area.

The post-Mesolithic locations also shed some light on the later cultural developments. The presence of Neolithic, Chalcolithic, Megalithic and Historical sites suggests the continuous cultural growth in the area.

The present day tribals are of great help for understanding the settlement and subsistence patterns of the prehistoric communities. All the sites of the area are situated near the tribal villages. Some of the tribals still lead nomadic ways of life and are basically hunters and food-gatherers. Some are settled in the villages and have now adopted agriculture. Among these some are extremely primitive and stay out of the villages near the forests. Their houses are made of bamboo and leaves and they mainly depend on natural products available in the forests and the animals which they hunt. Apart from their use as food wild plants are also used for medicinal purposes.

The present study has proved that the south eastern Madhya Pradesh, Raipur and Bilaspur belt, which incidentally is a part of the upper Mahanadi region, has special status in the progress of the prosperity of the Madhya Pradesh region. The present detailed archaeological investigations of the upper Mahanadi have thus established the necessity of micro-regional studies, for only through such detailed

analysis the personality of a larger region can properly be understood. One is tempted to refer the book 'Personality of India' written by Prof. B. Subba Rao who had very ably shown what is the Personality of India on the basis of the then available archaeological evidence. My work in the Mahanadi valley provides additional data for understanding the Personality of Chhattisgarh region of Madhya Pradesh.

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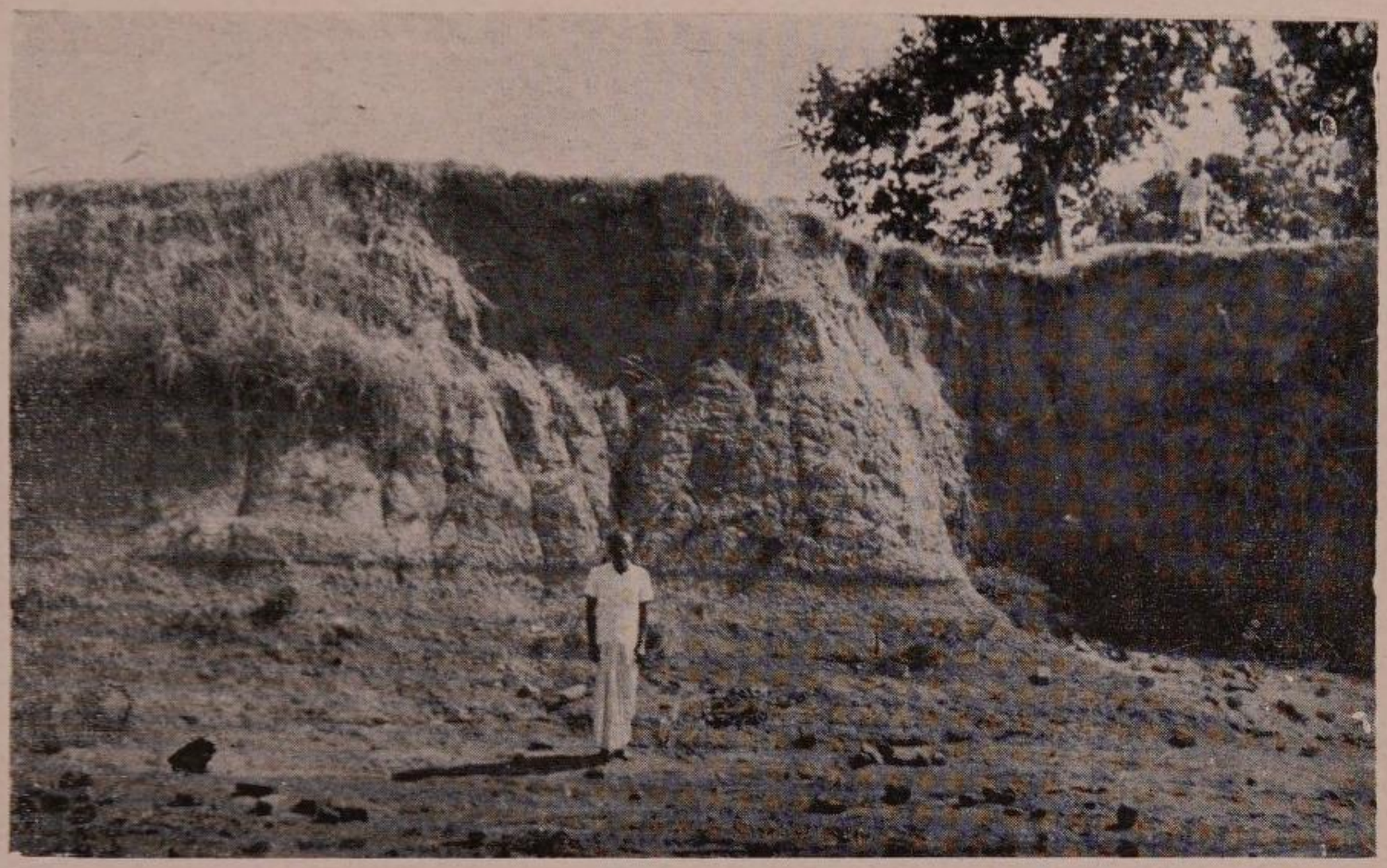
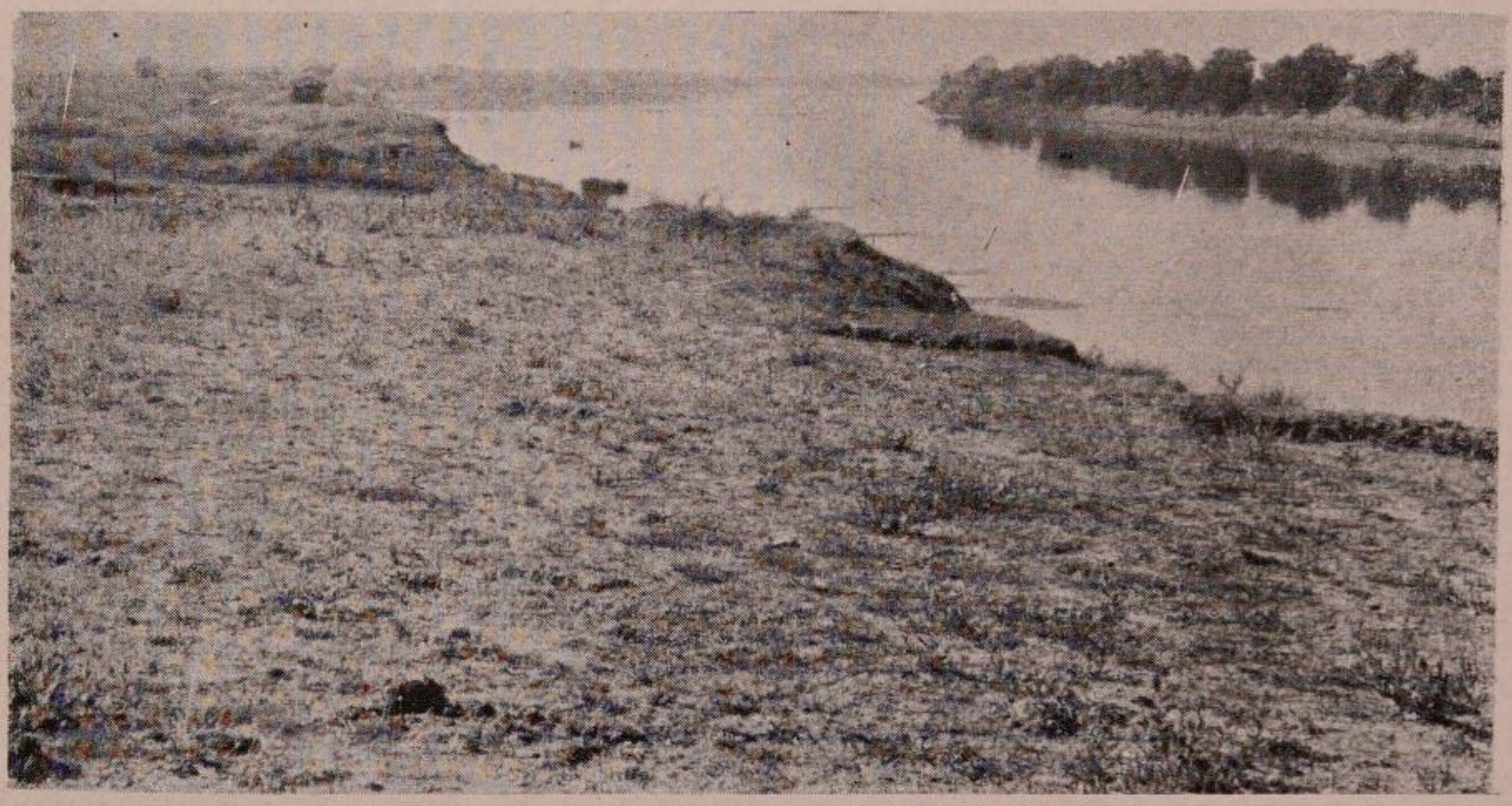
# ILLUSTRATIONS



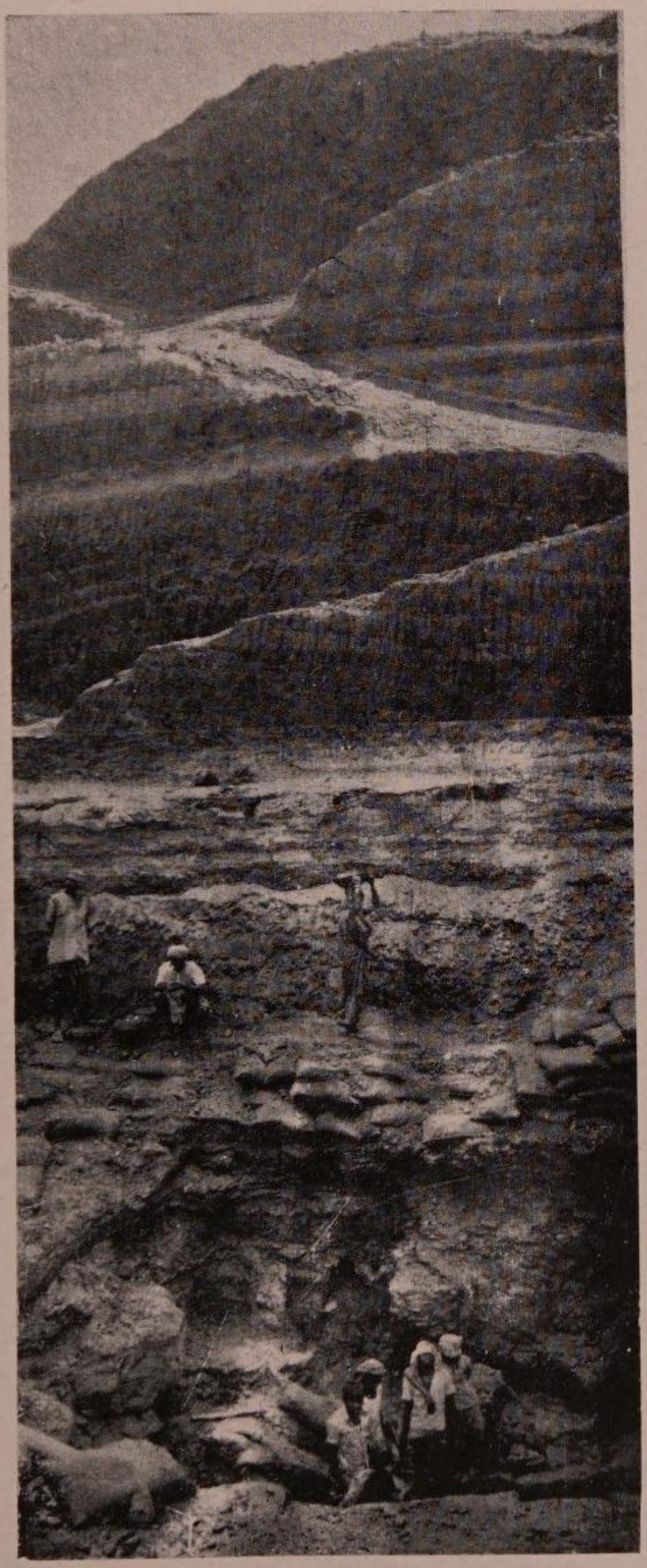
Terraces on the left bank of the Mahanadi near Tanhkapar Village

Alluvial section on the Mahanadi yielding Mesolithic industry
at Tanhkapar



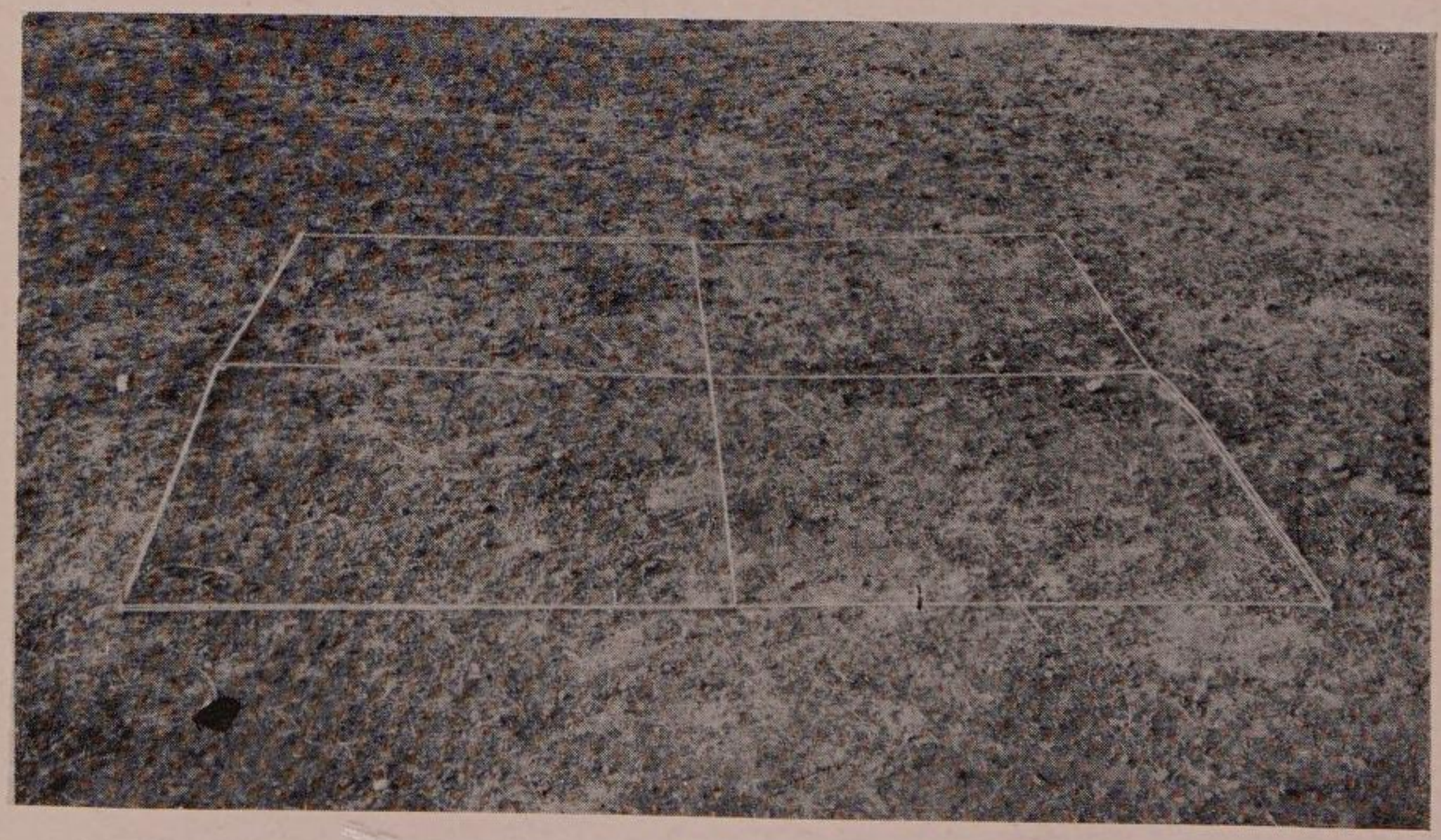
The Seonath meanders near Simga Town

Middle Palaeolithic site at Simga and alluviation on both the banks of the river

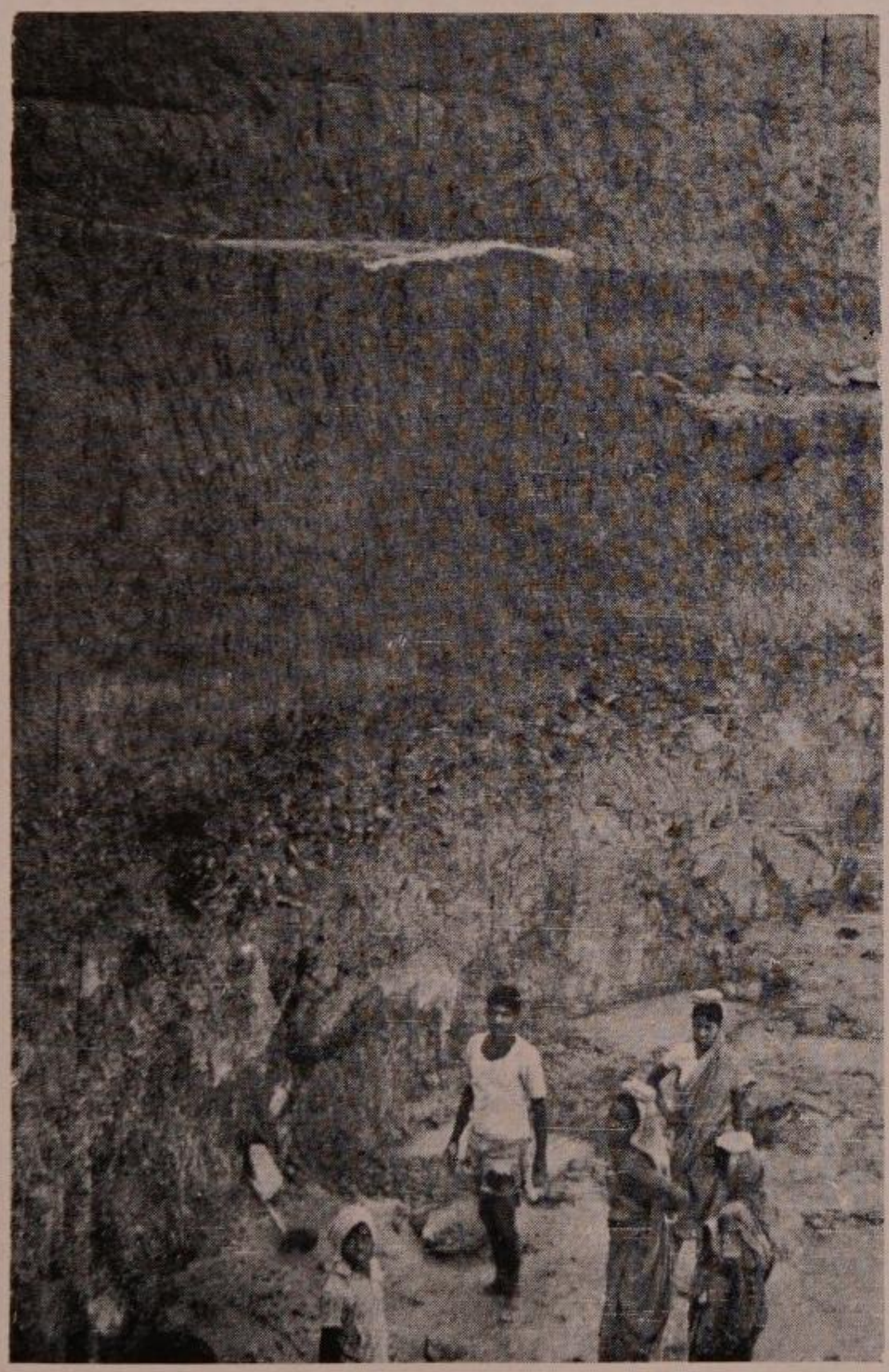


A section exposed during construction of a bridge near Nandghat. The gravel I, yielding Middle Palaeolithic tools and fossils, is at the base overlain by alluvial deposit in the form of bands of silt and sand

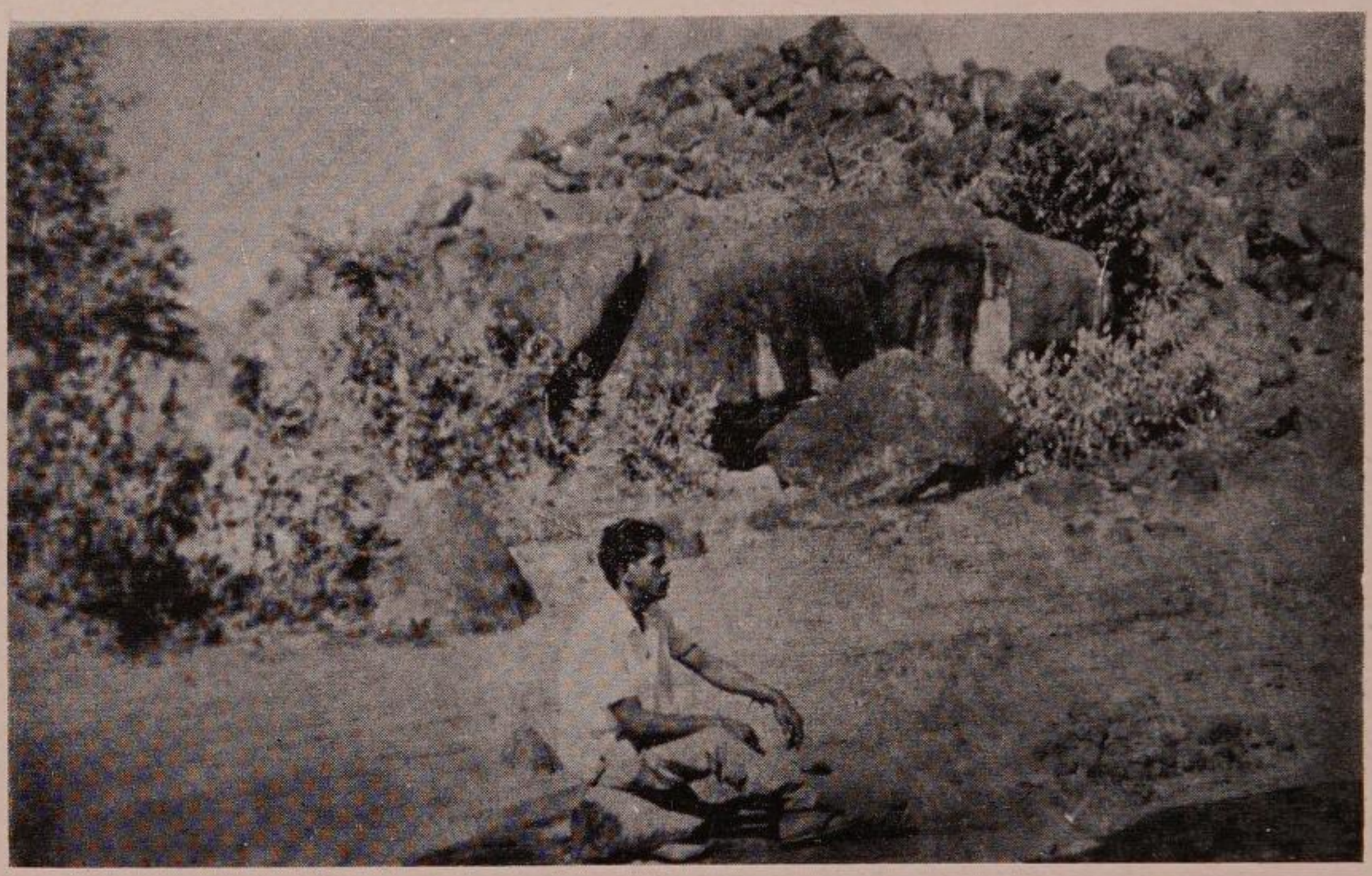
An Upper Palaeolithic site in the gravel II at Amlidih underlain the shales



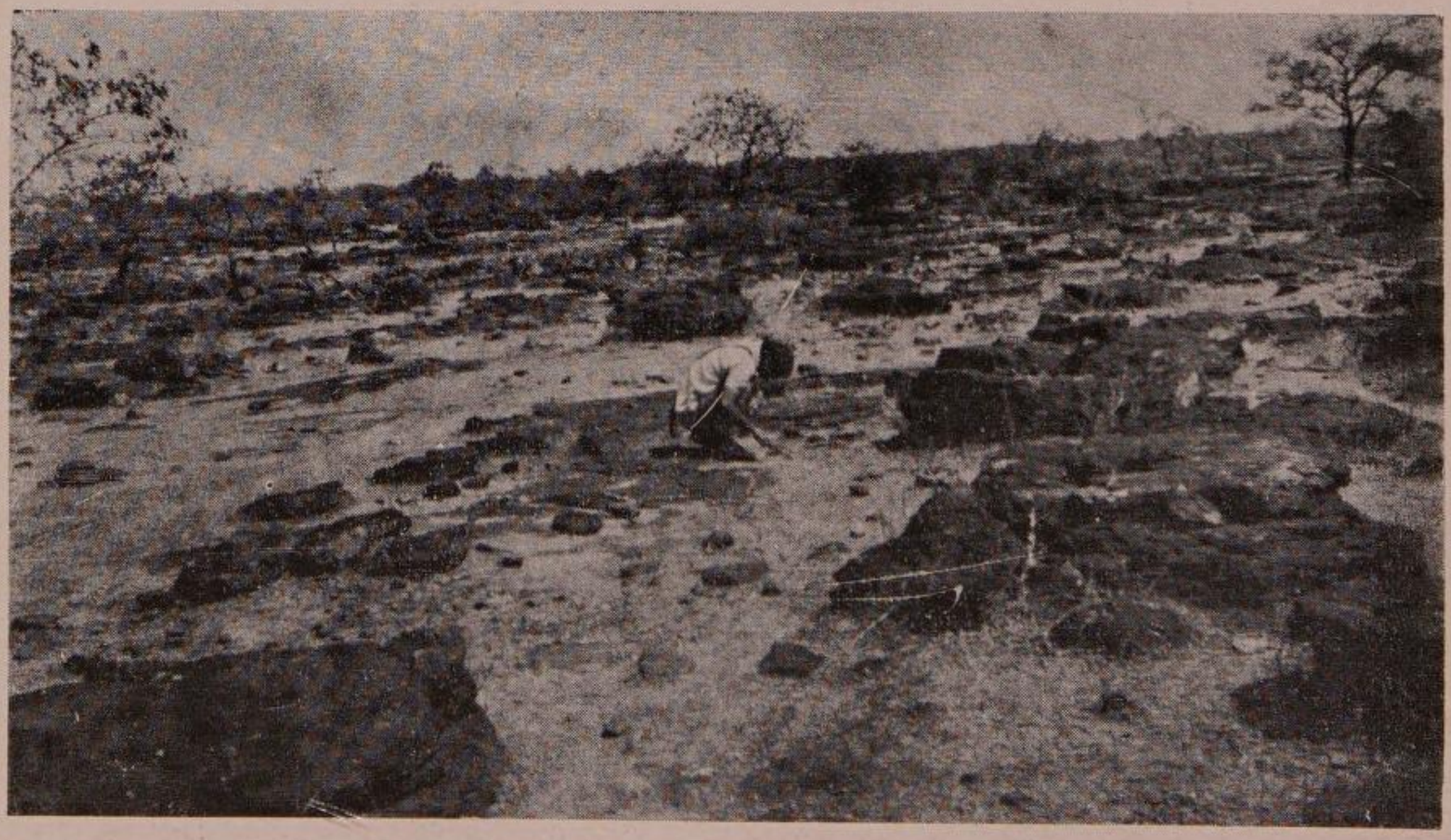
A gride-plan at the Upper Palaeolithic site at Simga for collecting tools for statistical studies



A section on the Jonk river exposed during the construction of dam at Arjuni



A Mesolithic site situated at the base of granitic hill near Khairkhera

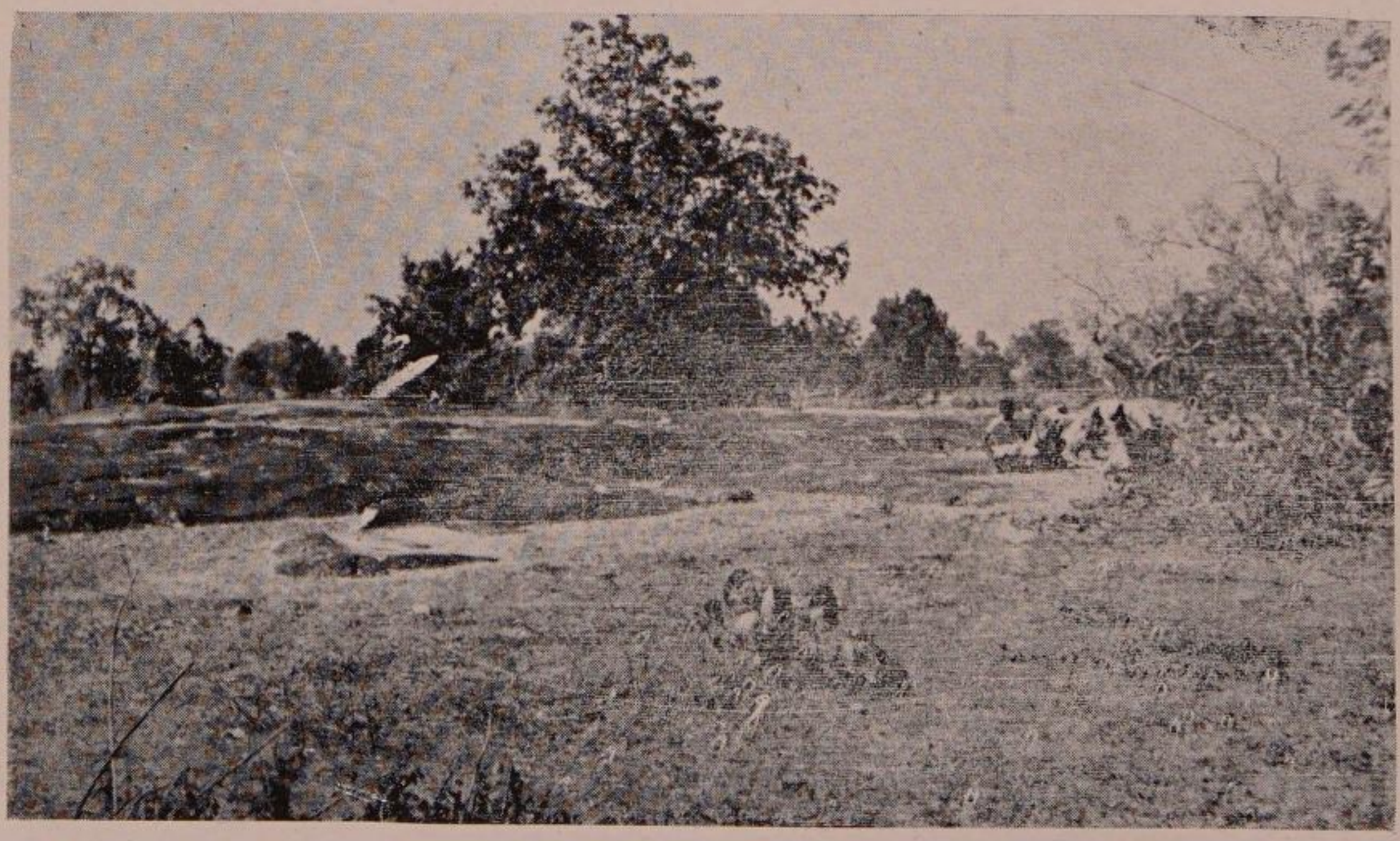


View of the Mesolithic site situated over the rocky surface at Sukda

Lower Palaeolithic site and a cave like shelter formed due to accumulation of granitic boulders near Haradula village

View of the Lower Palaeolithic site near the exposed dolerate dyke on which the tools have been fashioned at Bhilai

Mesolithic site on the quartzitic surface at Hataud

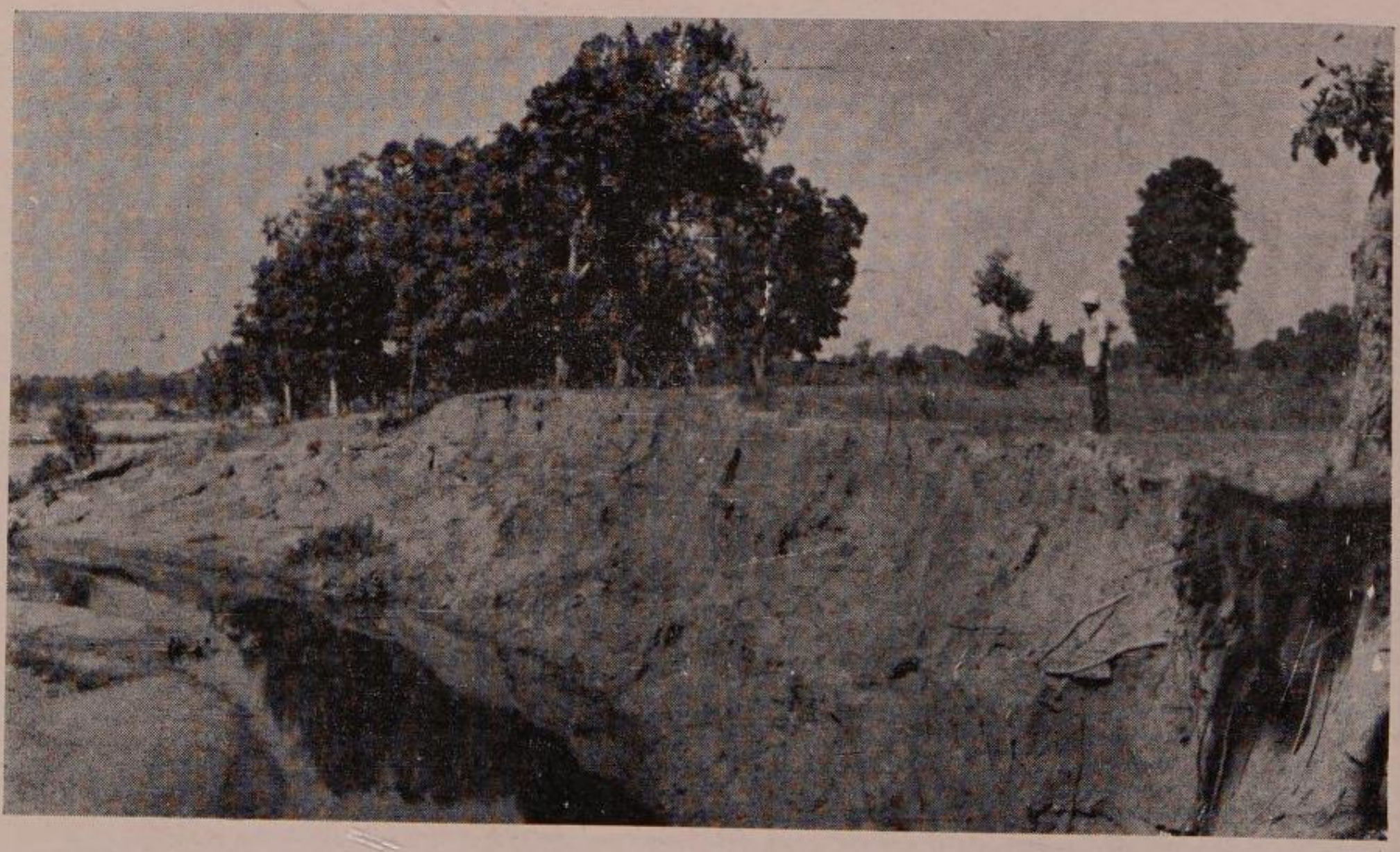


A Mesolithic site over the granitic surface at Sankra

View of the granitic hill yielding Mesolithic industry near Katghora

A Mesolithic site at Birtere

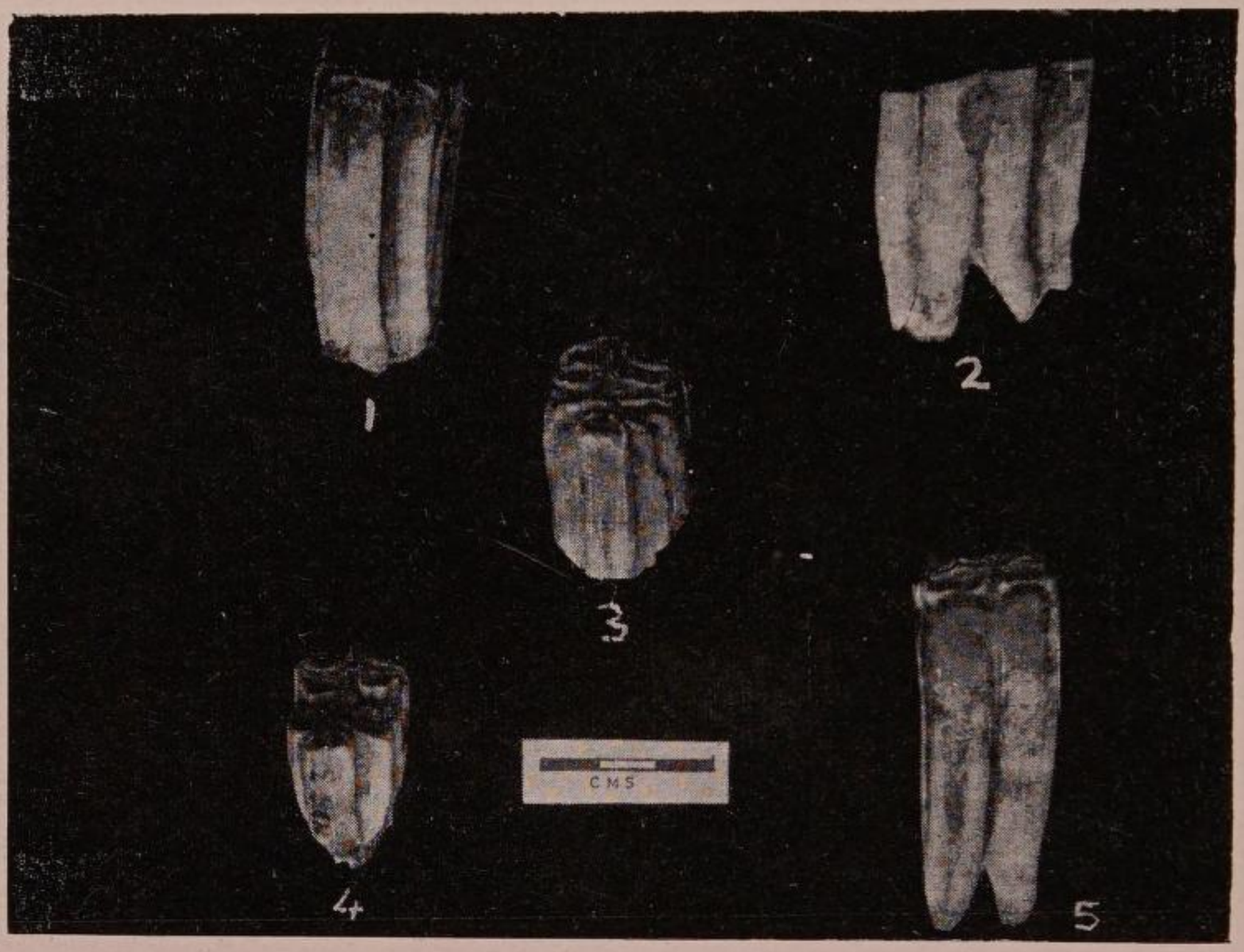
Alluvial section at Katgi on the right bank of the Jonk river



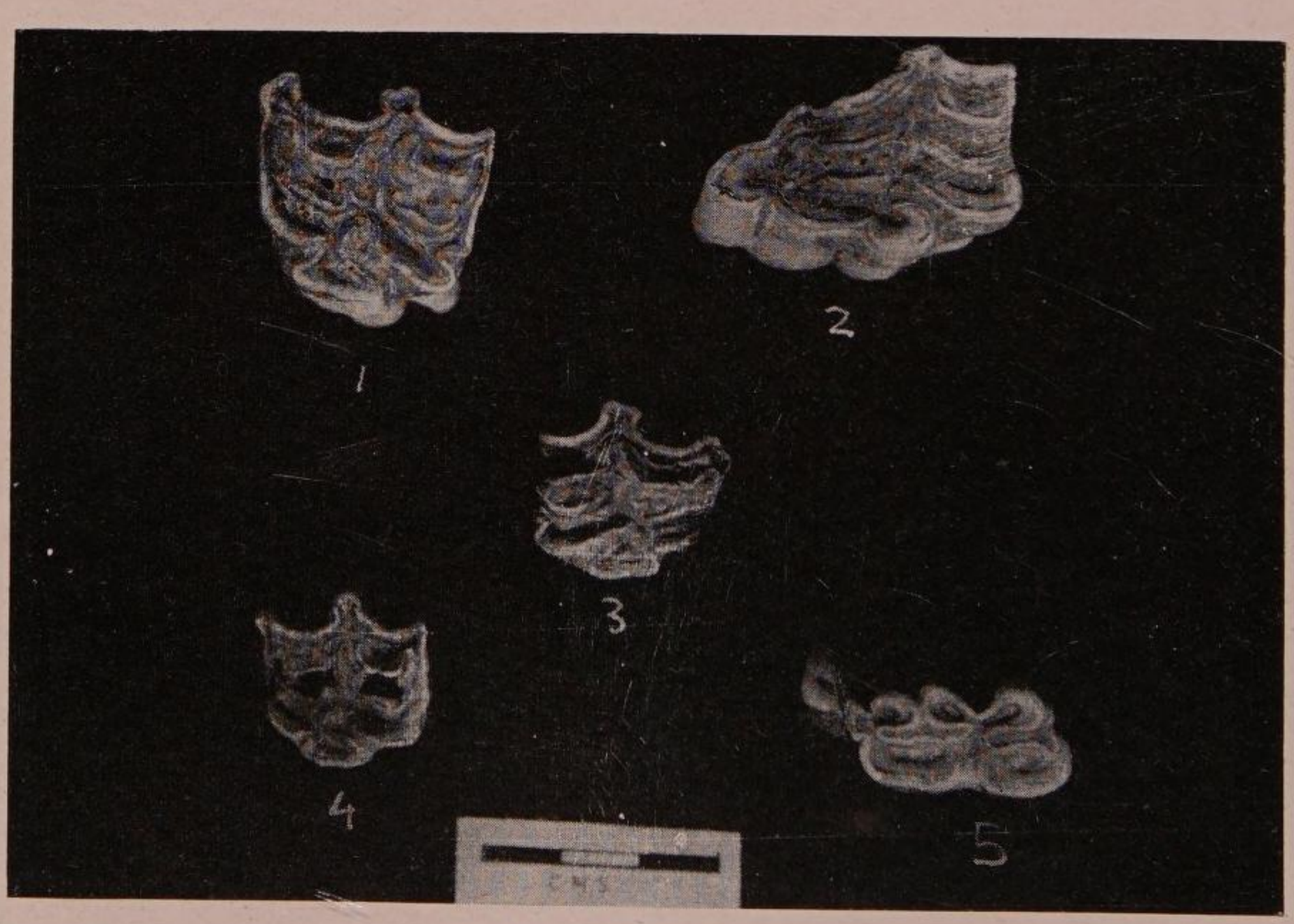
A section on the Jonk river near Sankra

View of a cave near Kurrubhat village

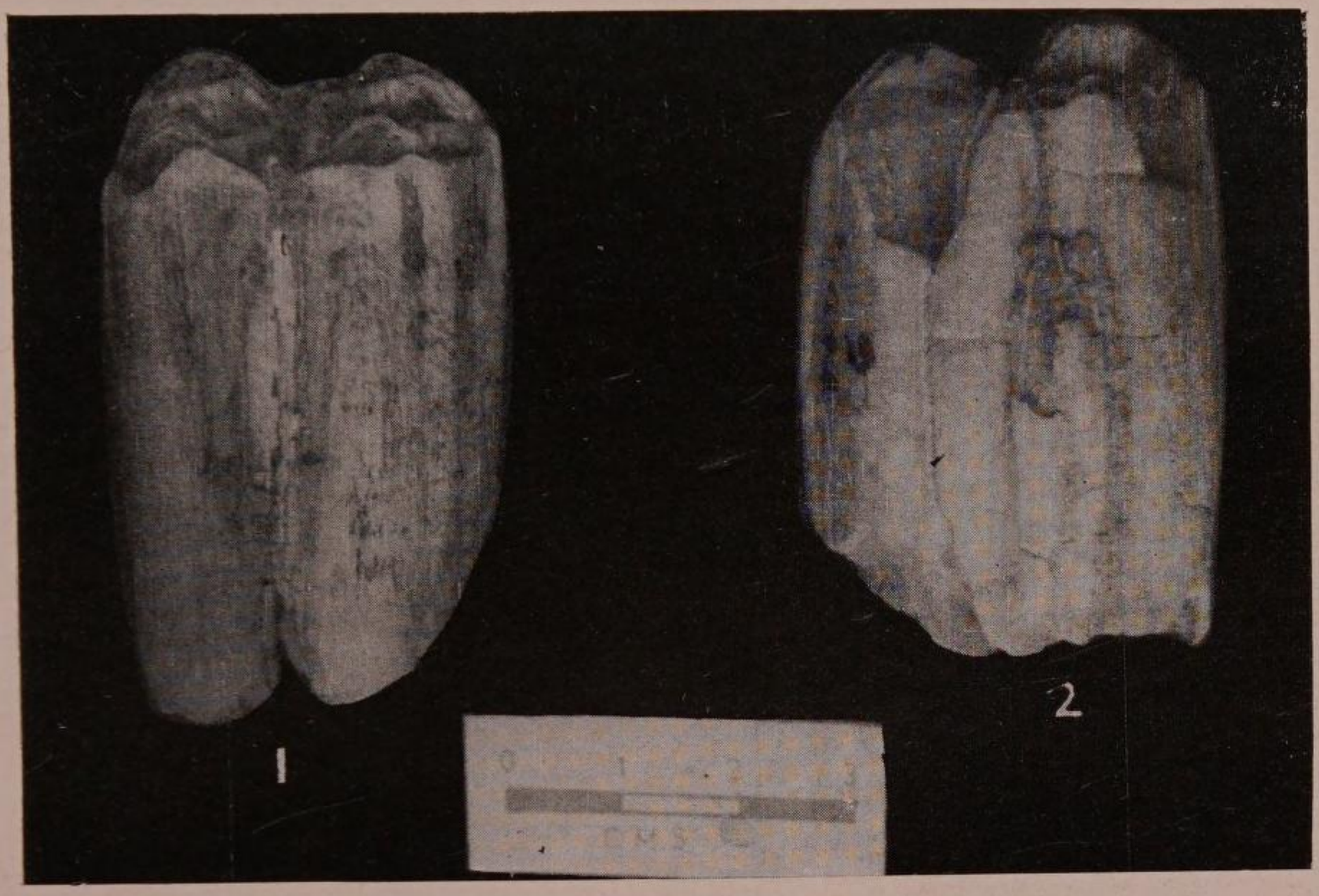
Gullied lateritic surface near Bhilai



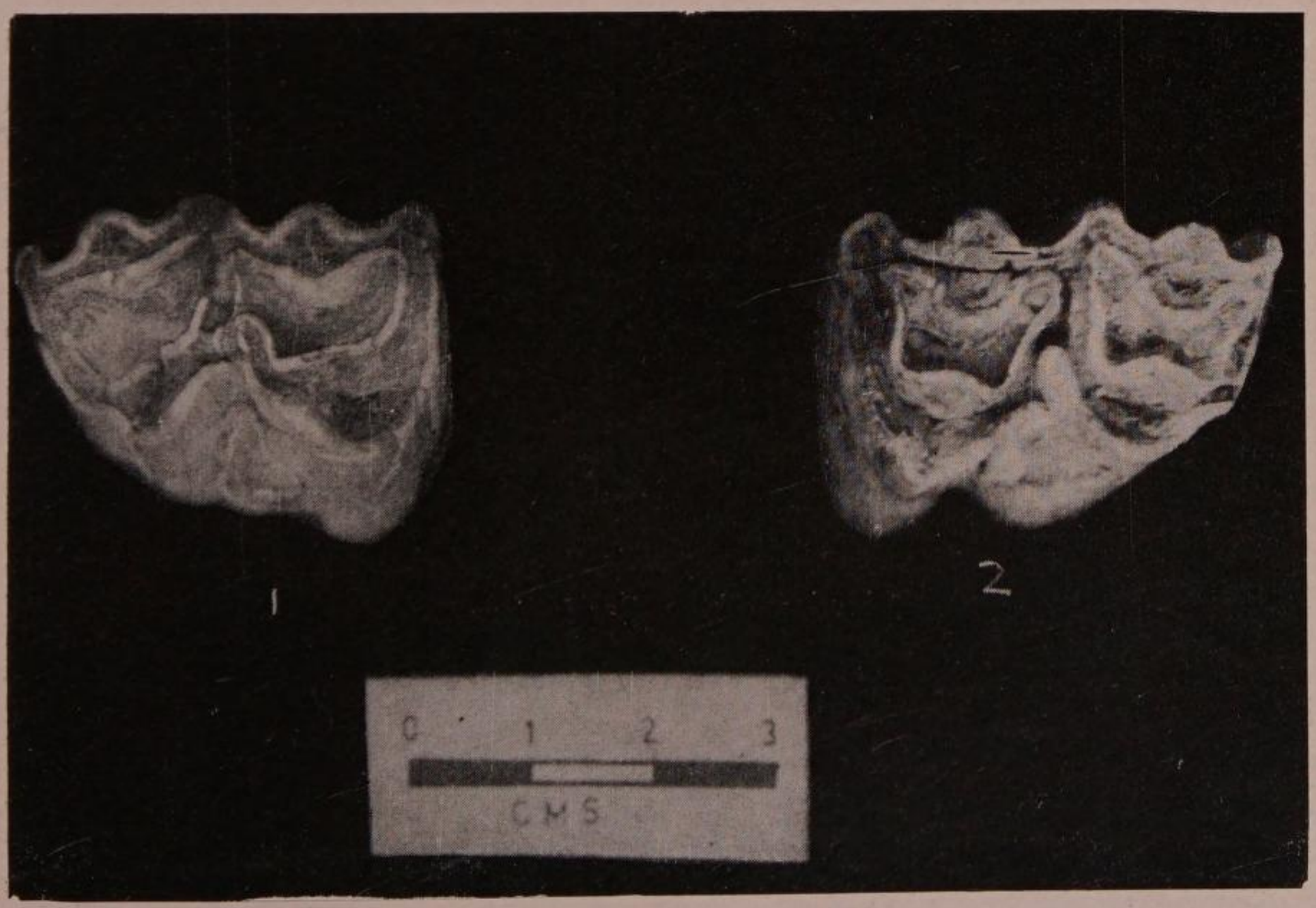

Side view of *Equus species*



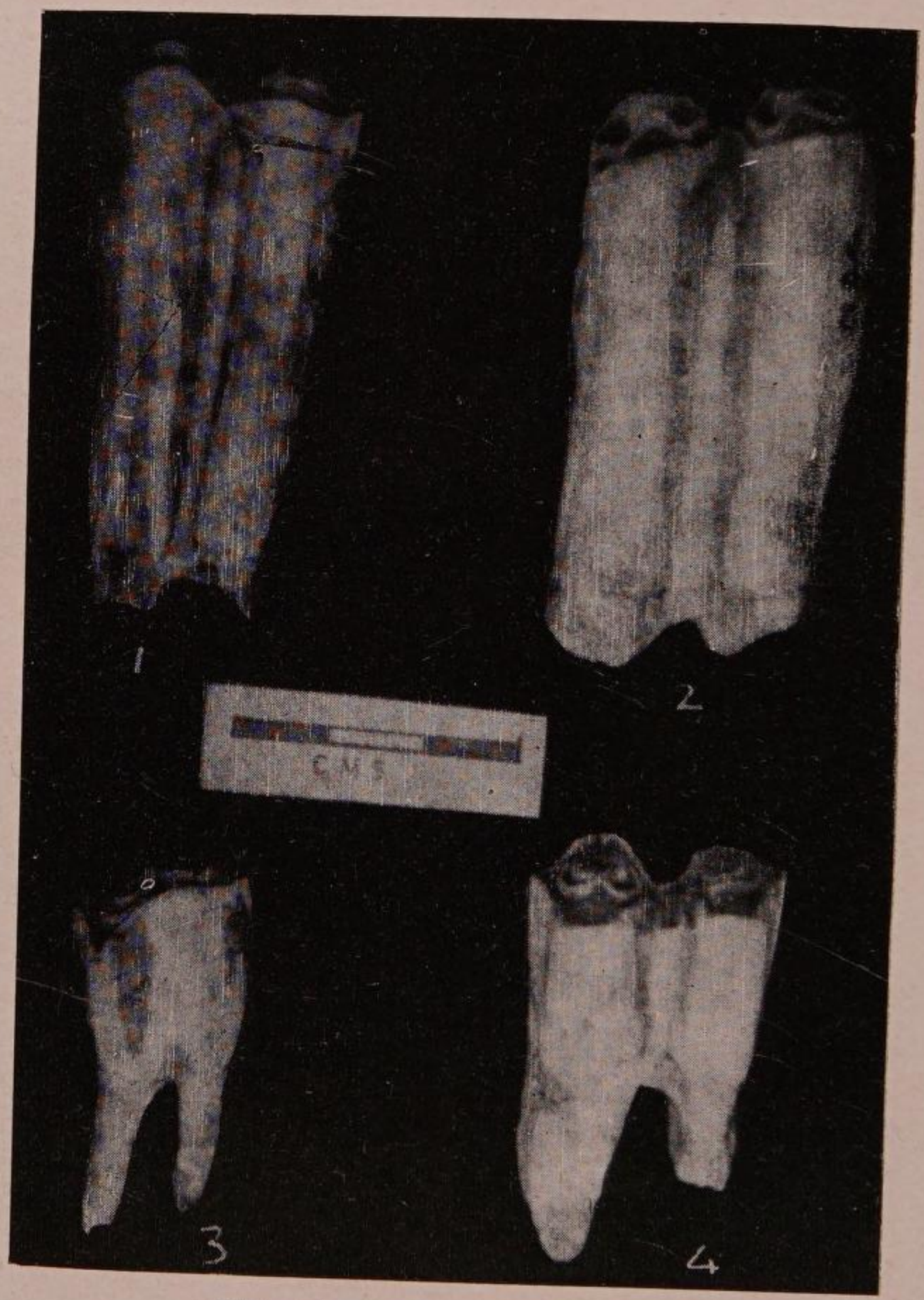

Crown view of the *Equus species*



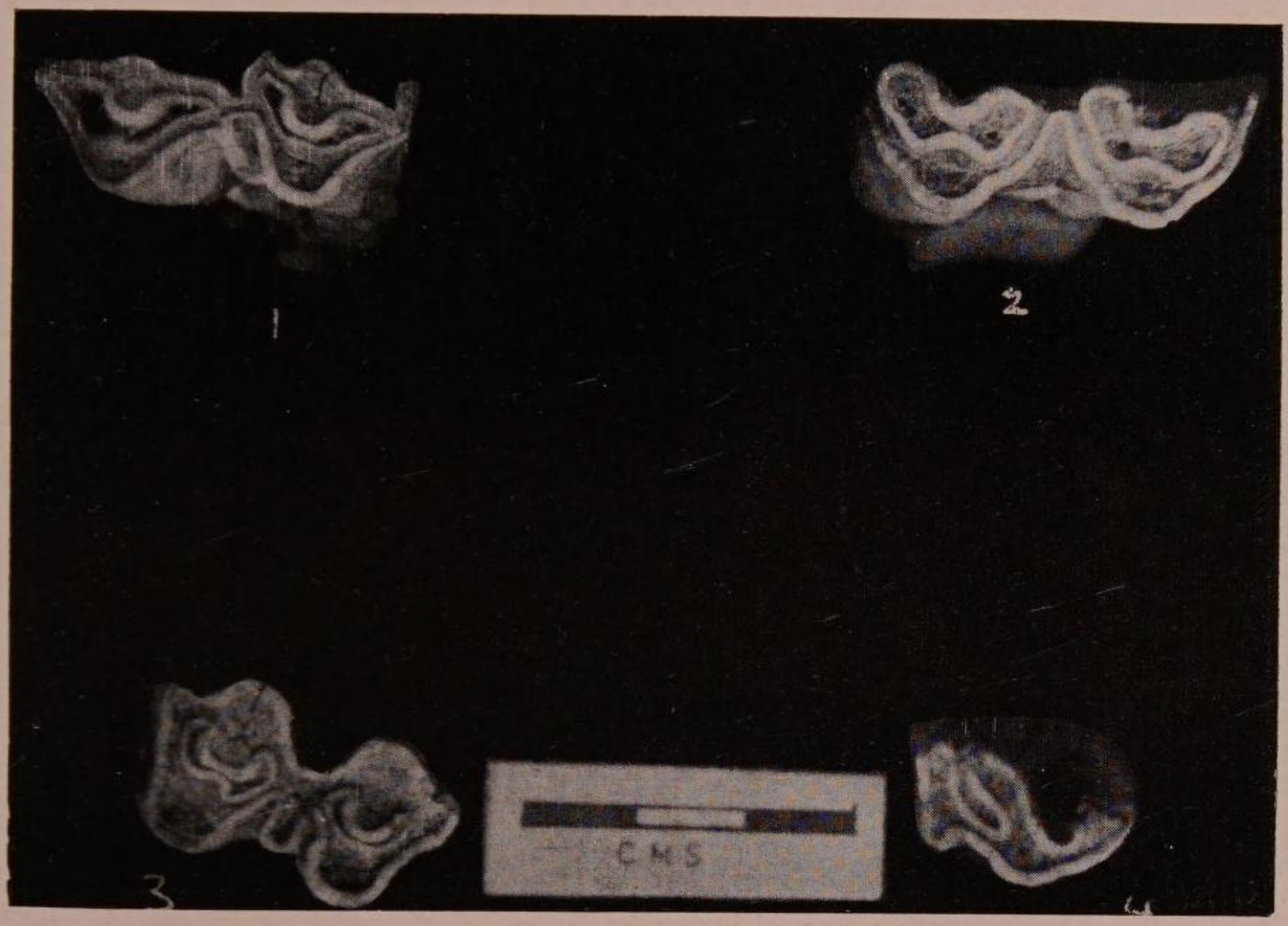

Side view of the *Bos namadicus*



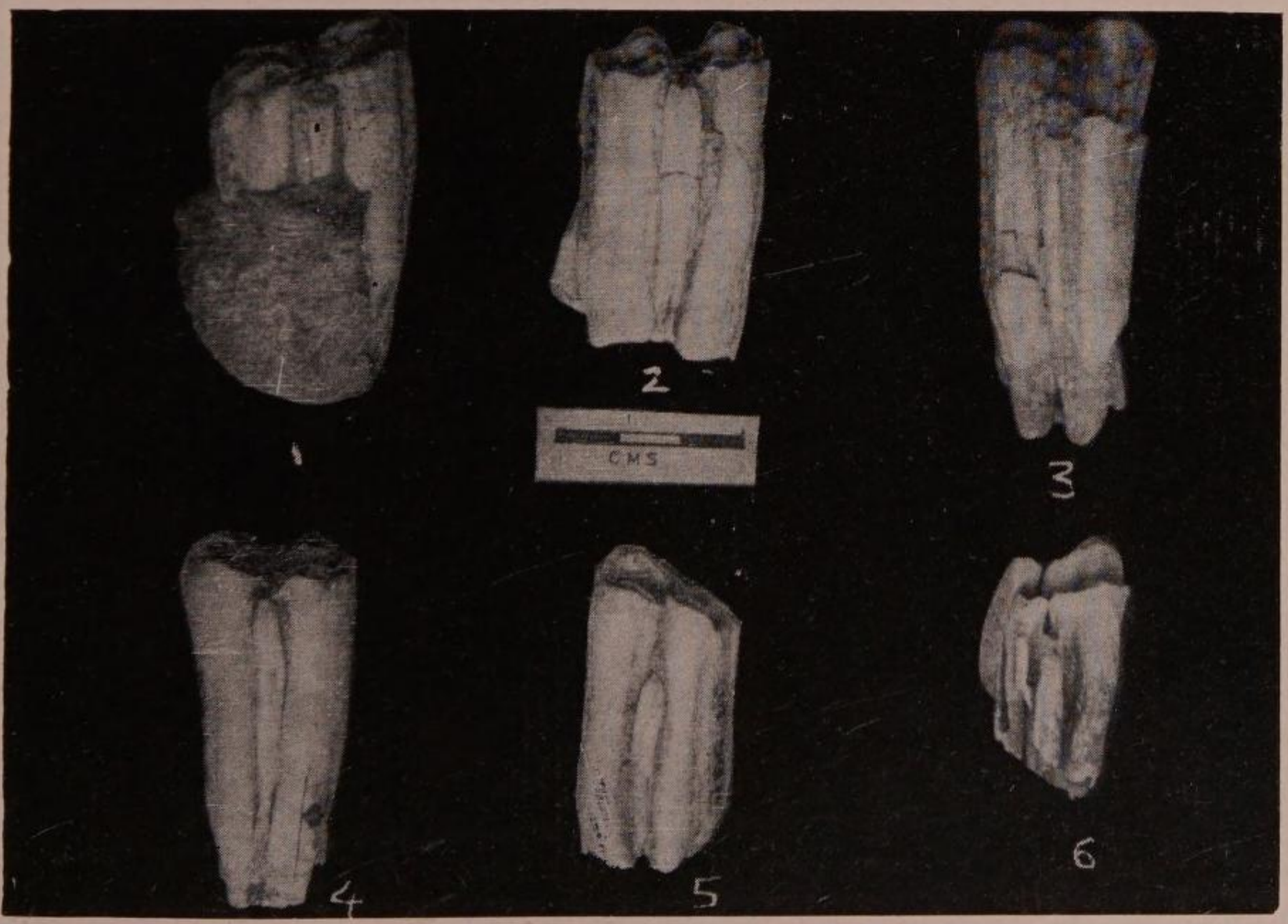

Crown view of the *Bos namadicus*



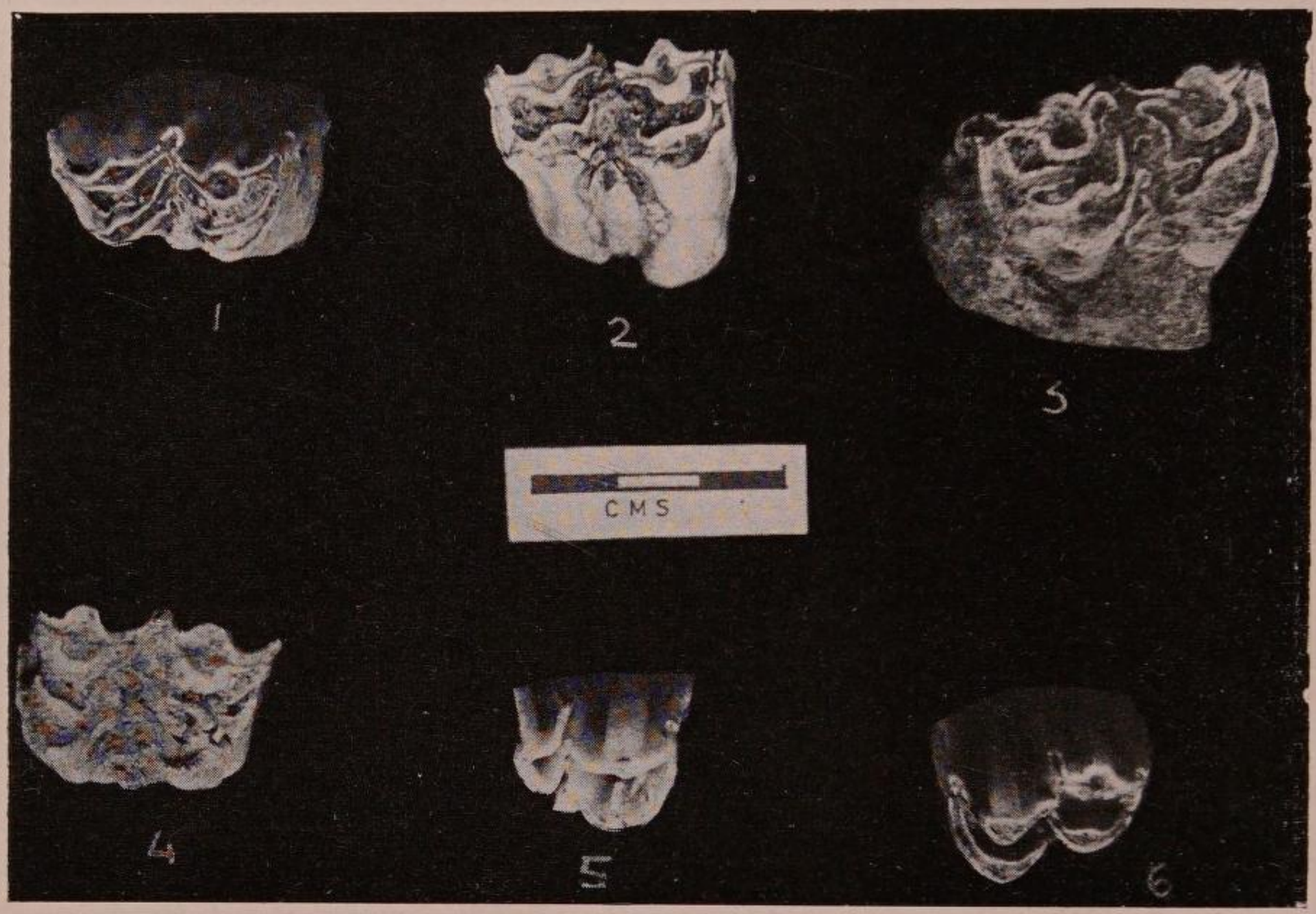

Side view of the *Bos Indicus*



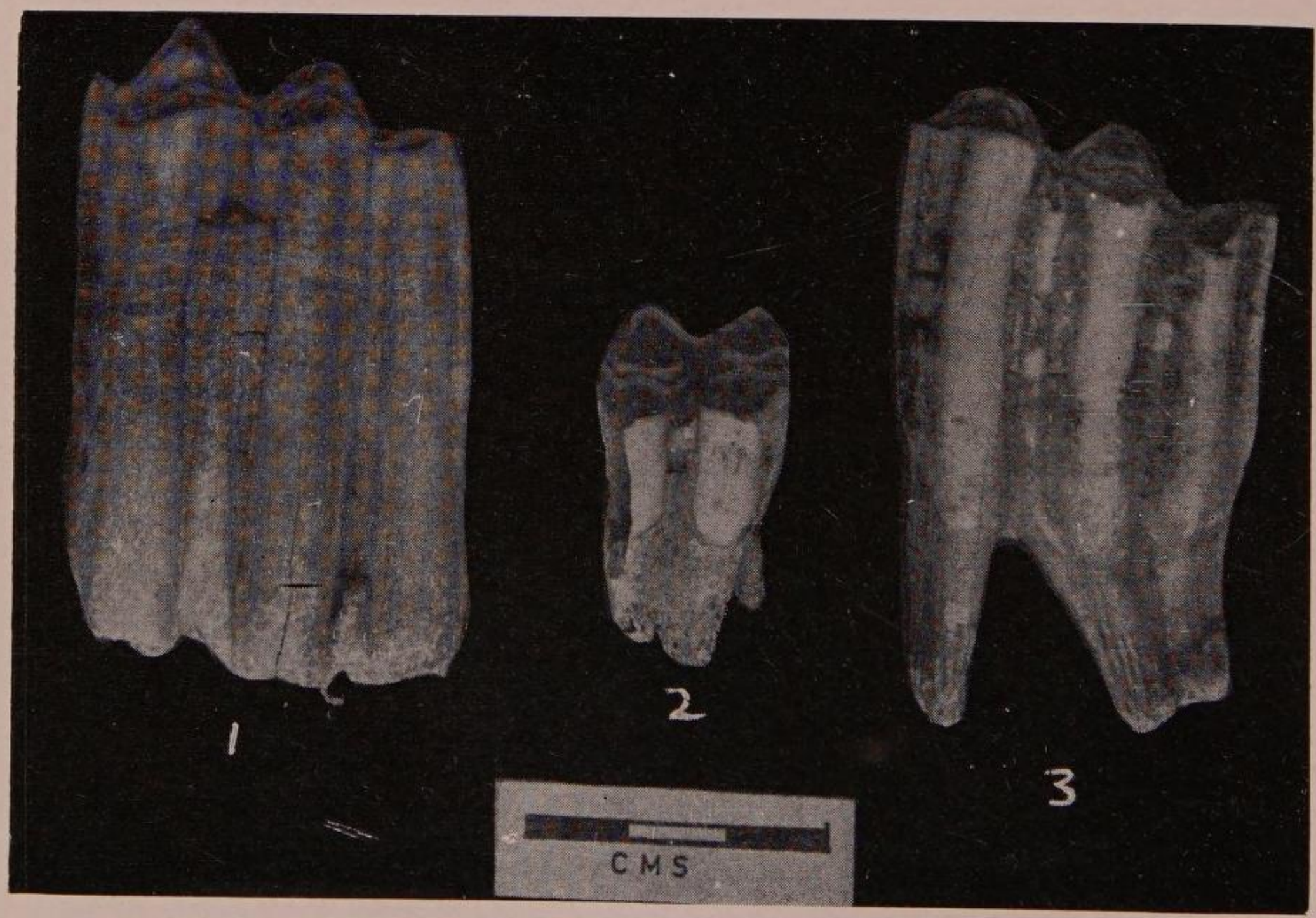

Crown view of the *Bos indicus*



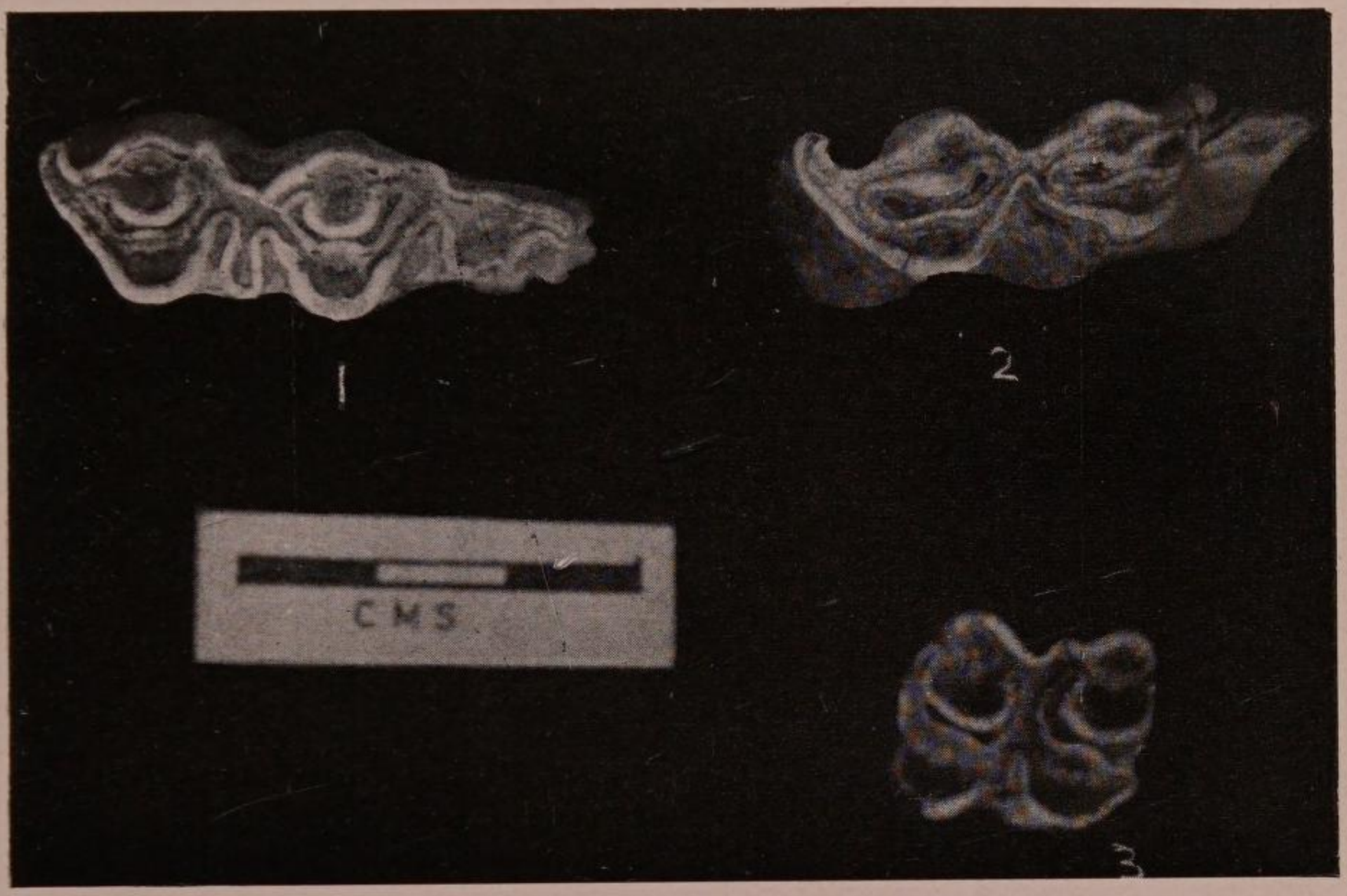

Side view of the *Bos indicus*




Crown wiew of the *Bos indicus*

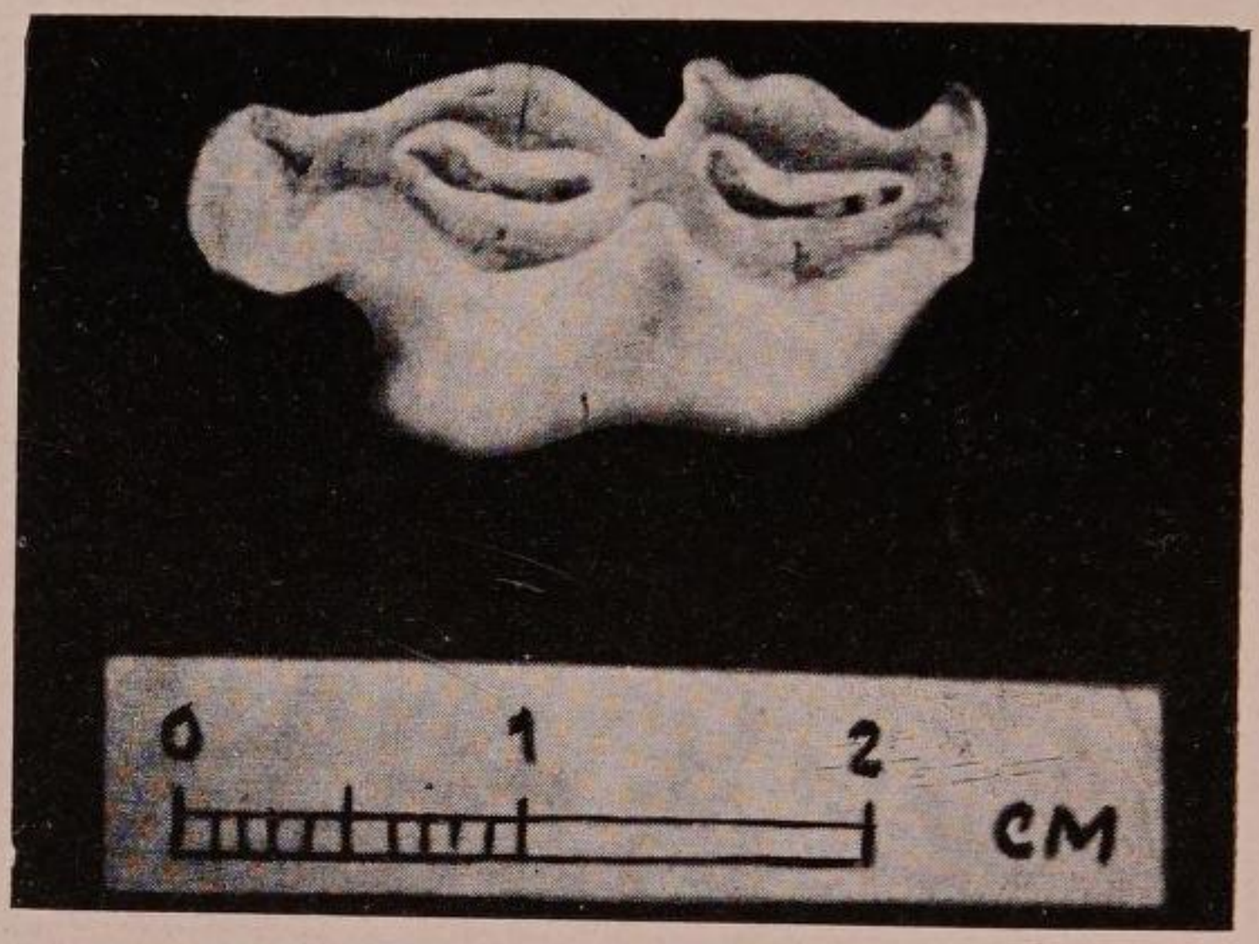



Side view of the *Bubalus bubalis*

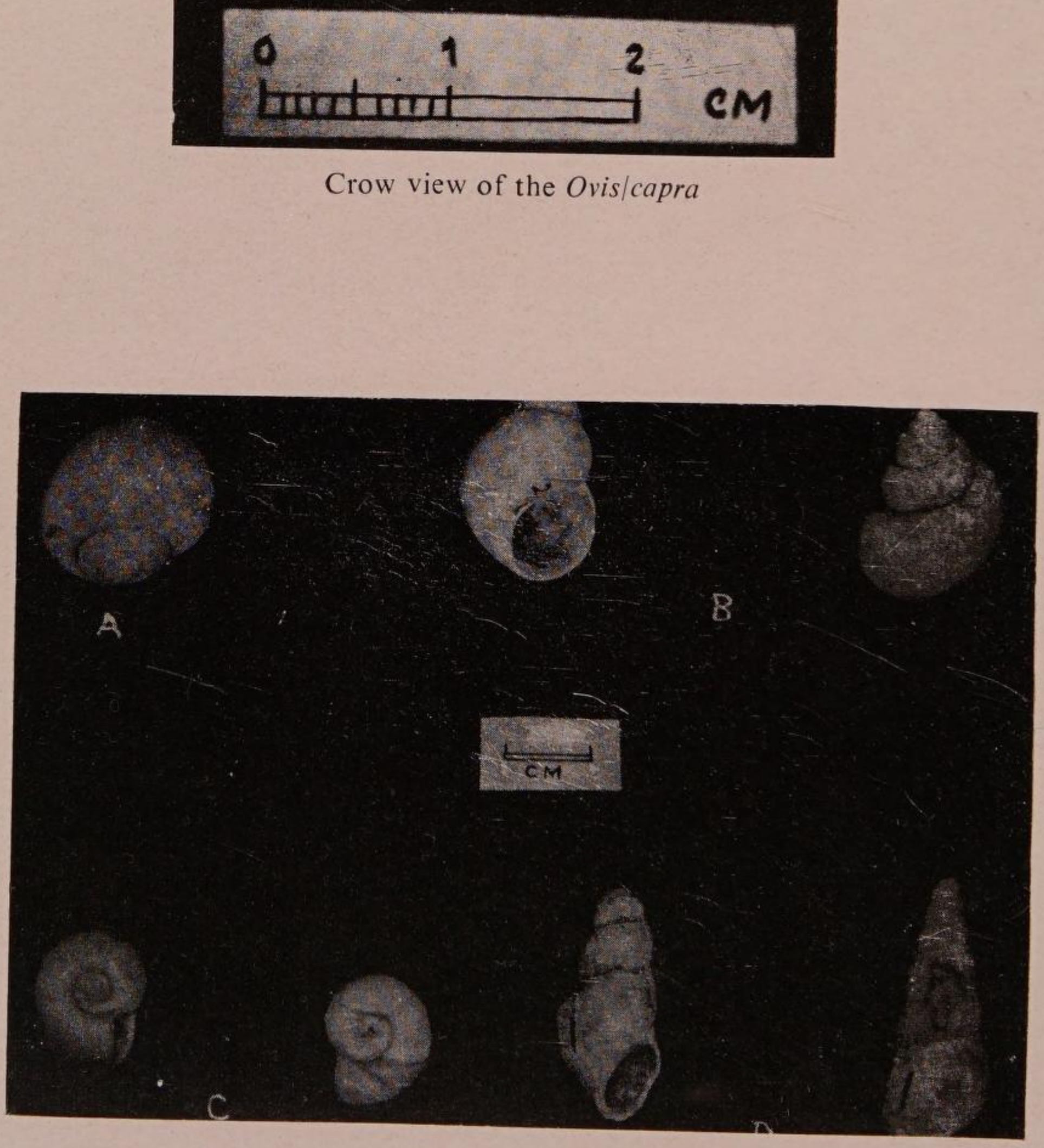



Crown of the *Bubalus bubalis*

Side view of the *Ouis/capra*




Crow view of the *Ovis/capra*




View of the molluscan shells

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Apart from being a teacher, he has keen interest in field archaeological research and has participated in several excavations of different cultural periods covering right from the Prehistoric to the Historical periods. He has also published several papers in various journals of national and international repute, on Prehistory, Quaternary Geology, Palaeontology, Geomorphology and Statistics.

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